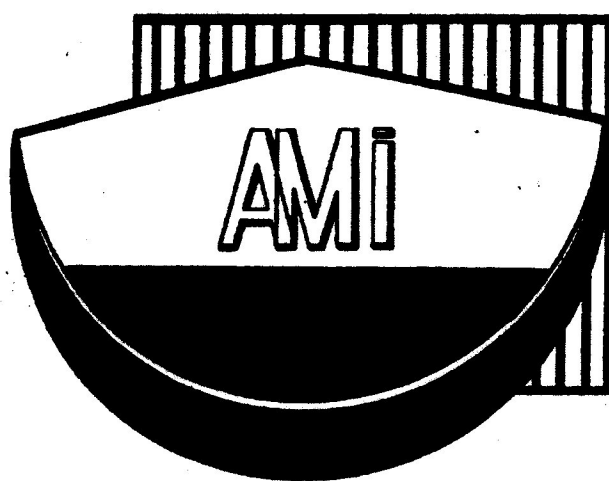


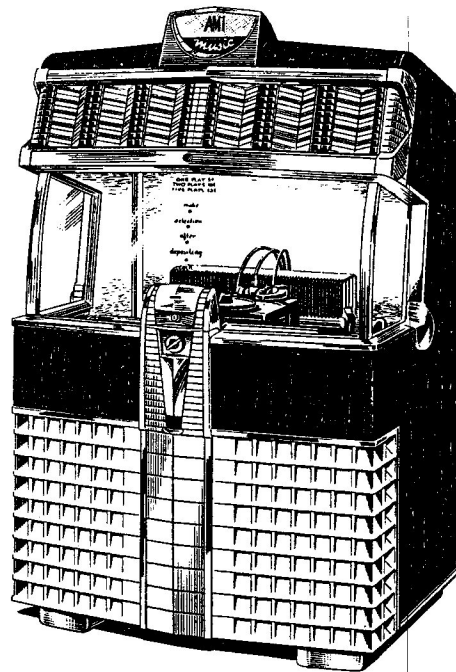
120 **80** **TE**



**SERVICE
MANUAL**

AMi *Incorporated*

DECORATIVE FEATURES OF THE MODEL E PHONOGRAPH



AMI *Incorporated*

1500 UNION AVENUE, S.E.
GRAND RAPIDS 2, MICHIGAN

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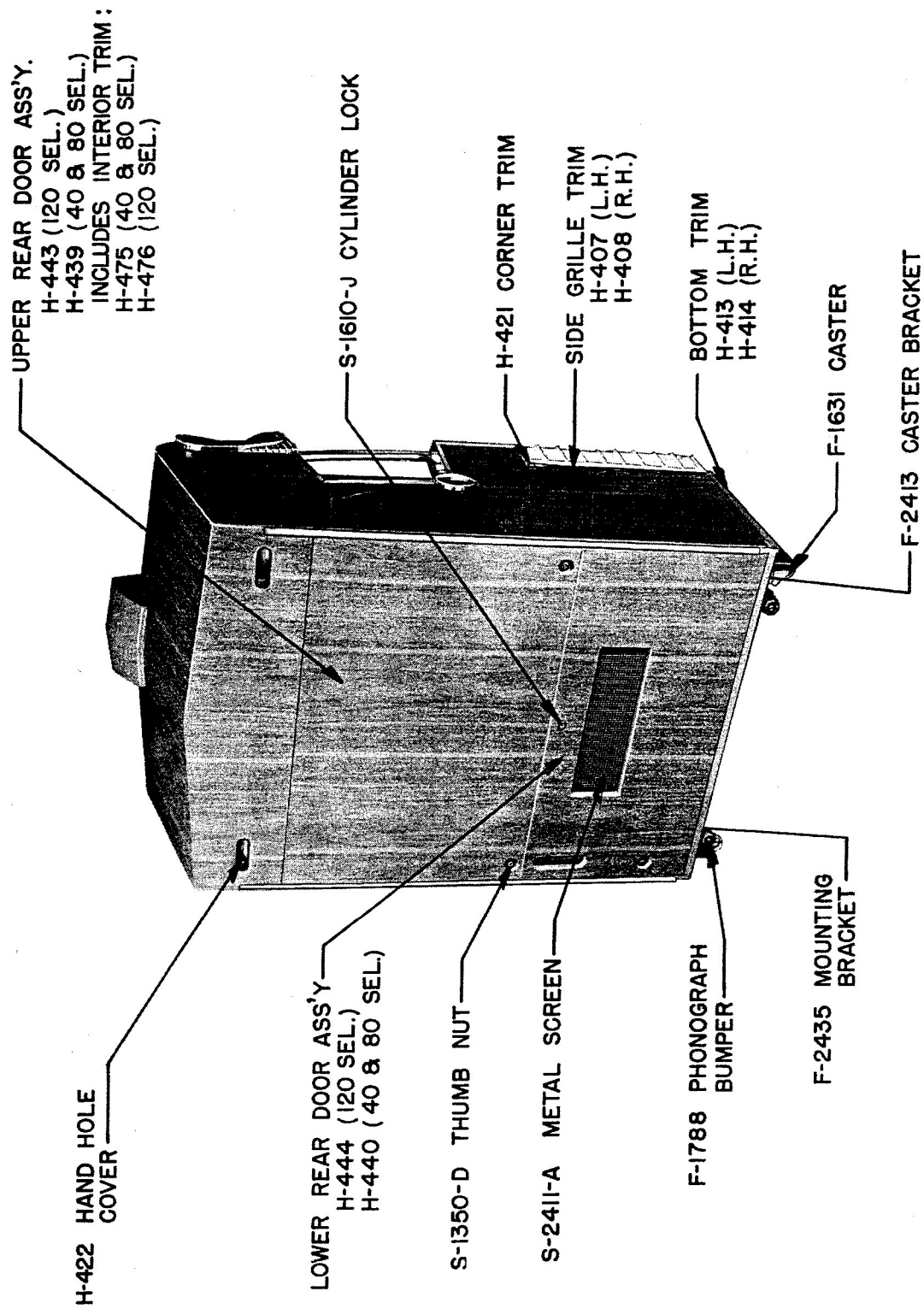
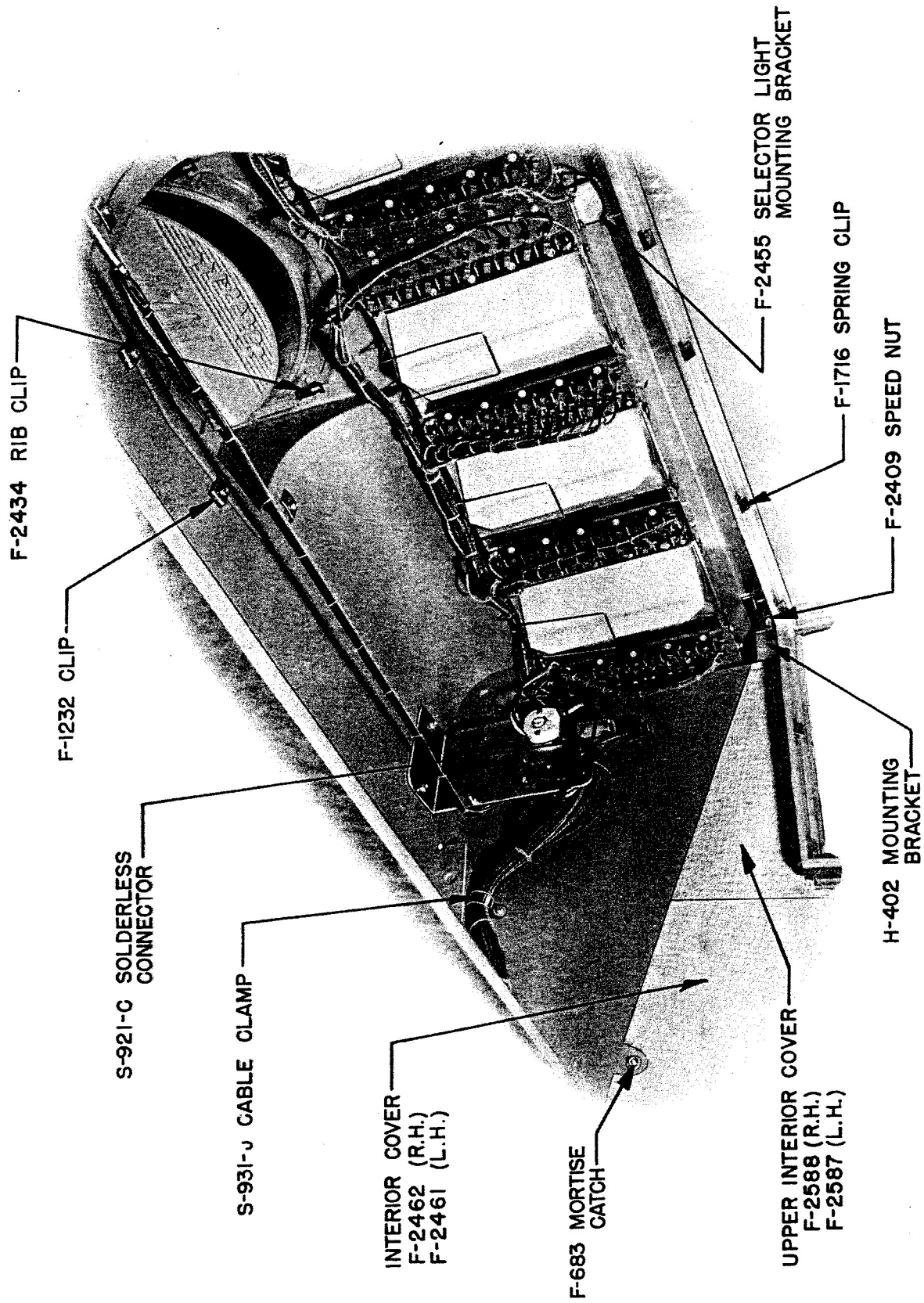


FIG. 3. -- REAR VIEW -- MODEL E PHONOGRAPH



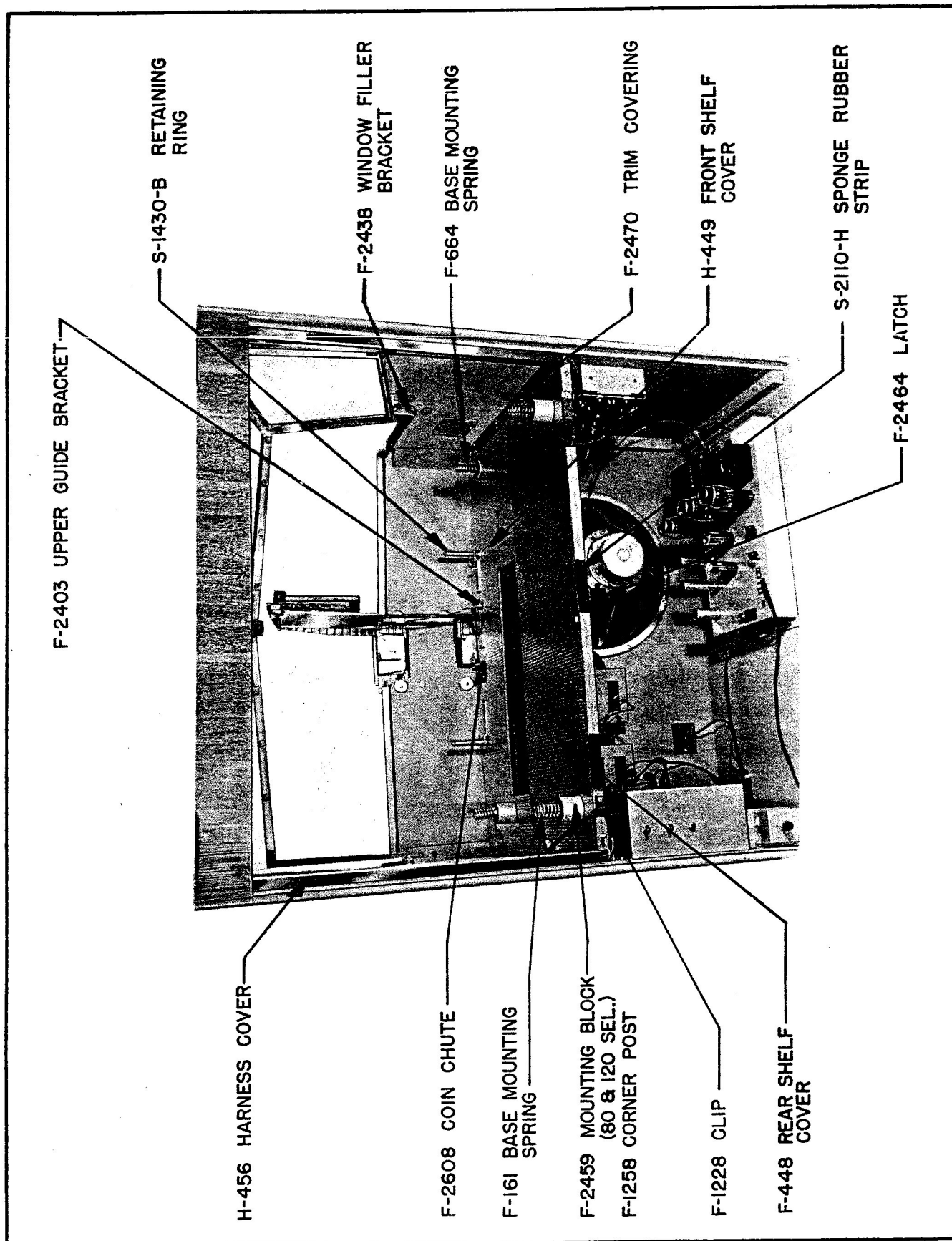


FIG. 5. - INTERIOR VIEW - MODEL E-120 PHONOGRAPH

L-296 COLOR TUBE ASS'Y.

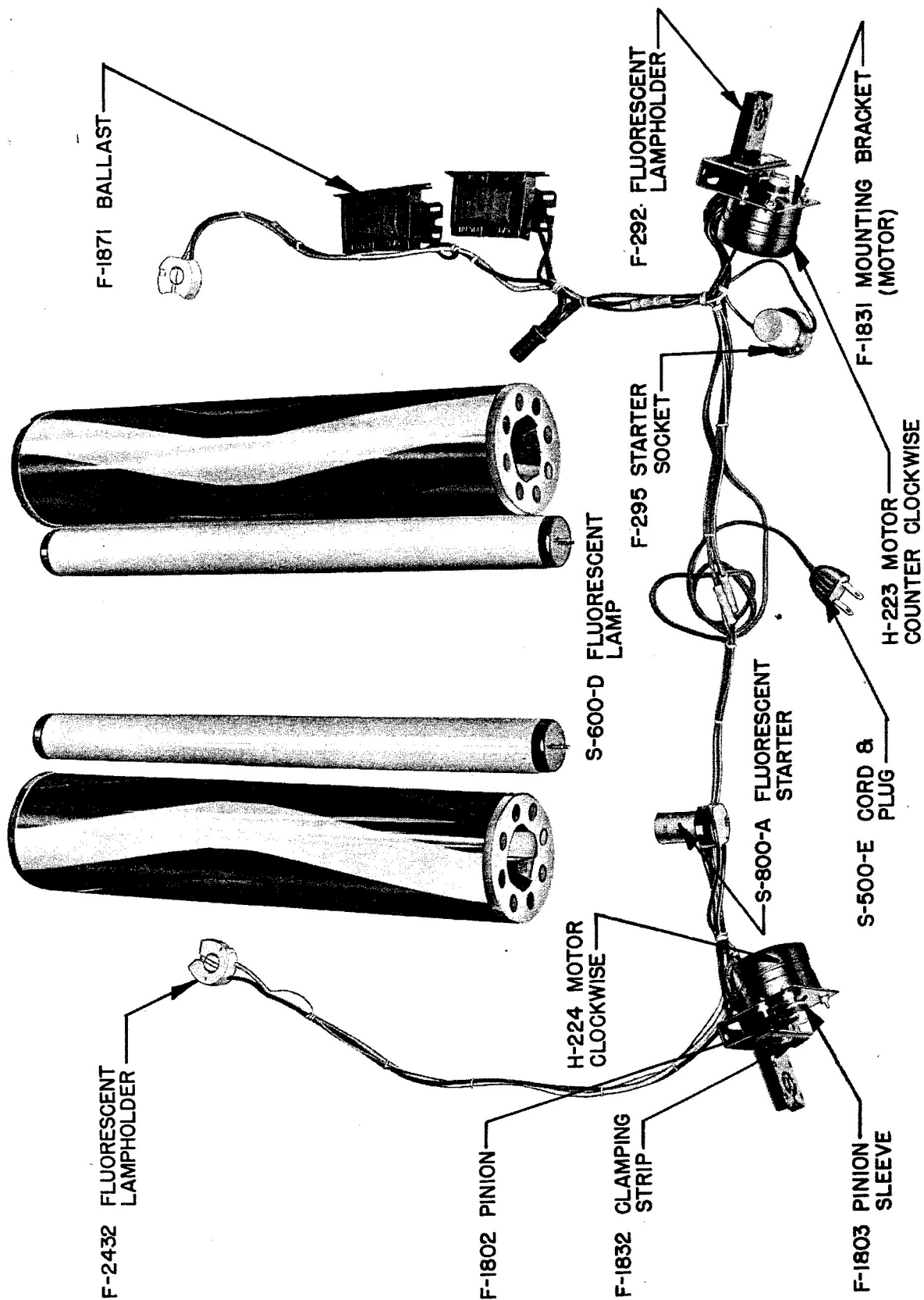


FIG. 6. - LOWER COLOR LIGHT ASSEMBLY

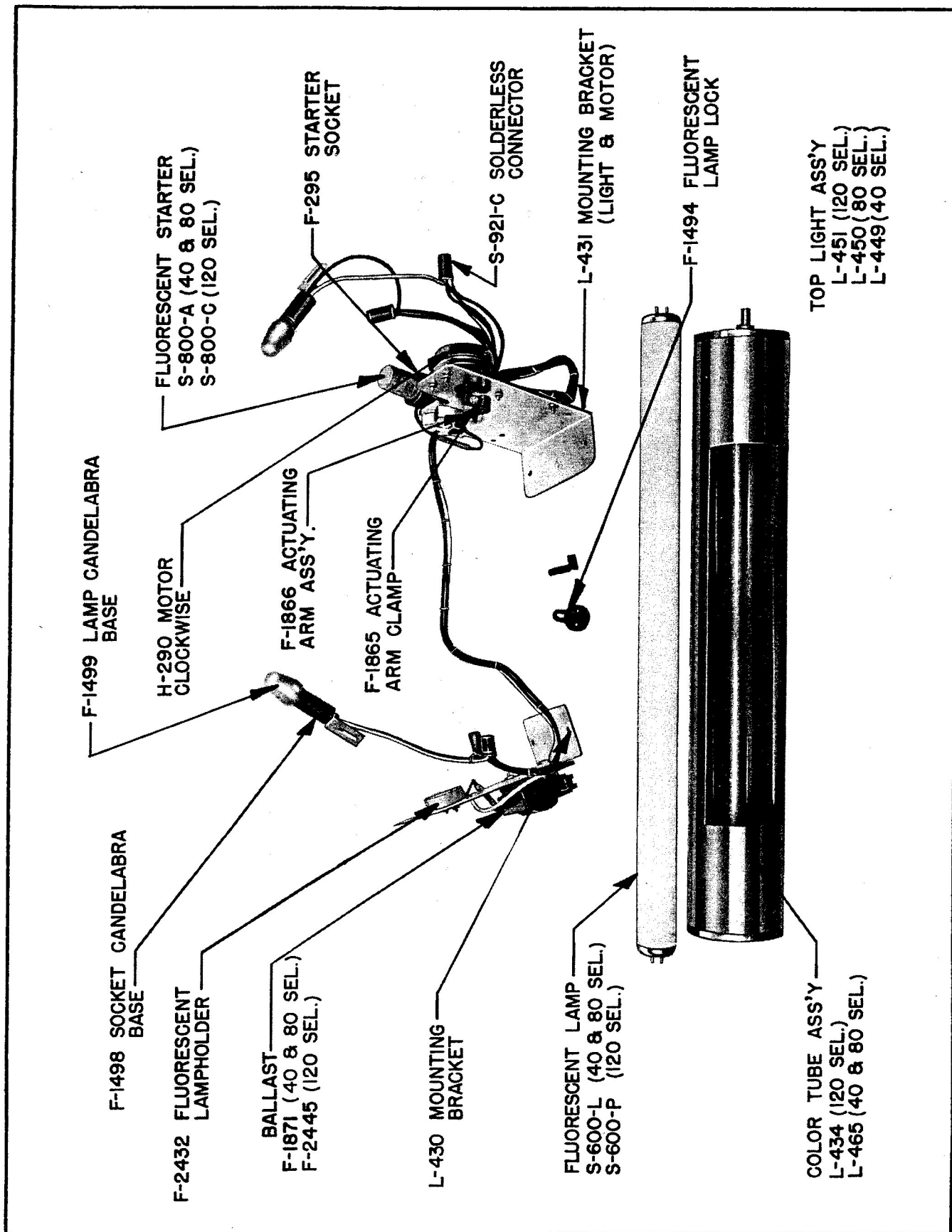


FIG. 7. -- TOP COLOR LIGHT ASSEMBLY

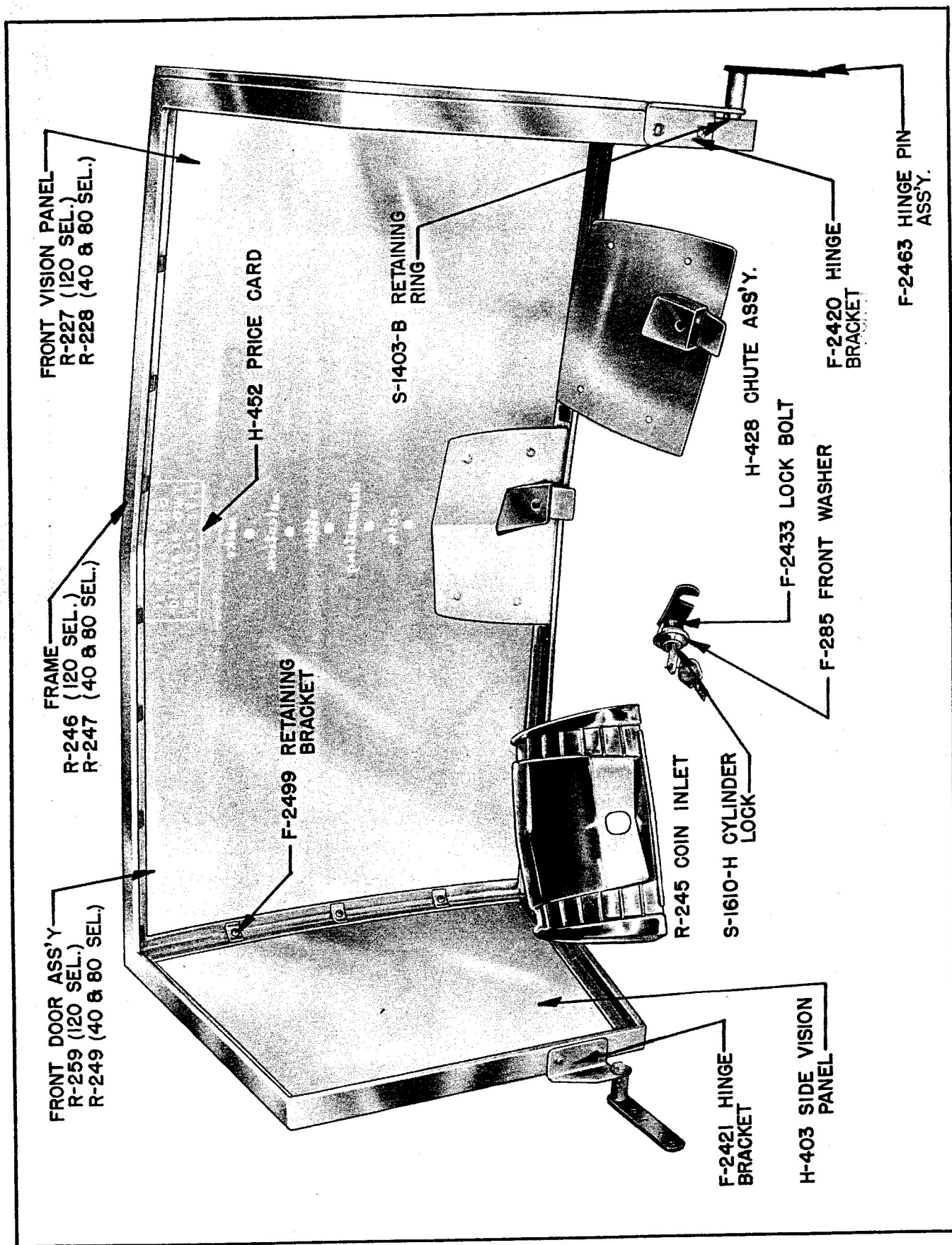


FIG. 8. - FRONT DOOR ASSEMBLY

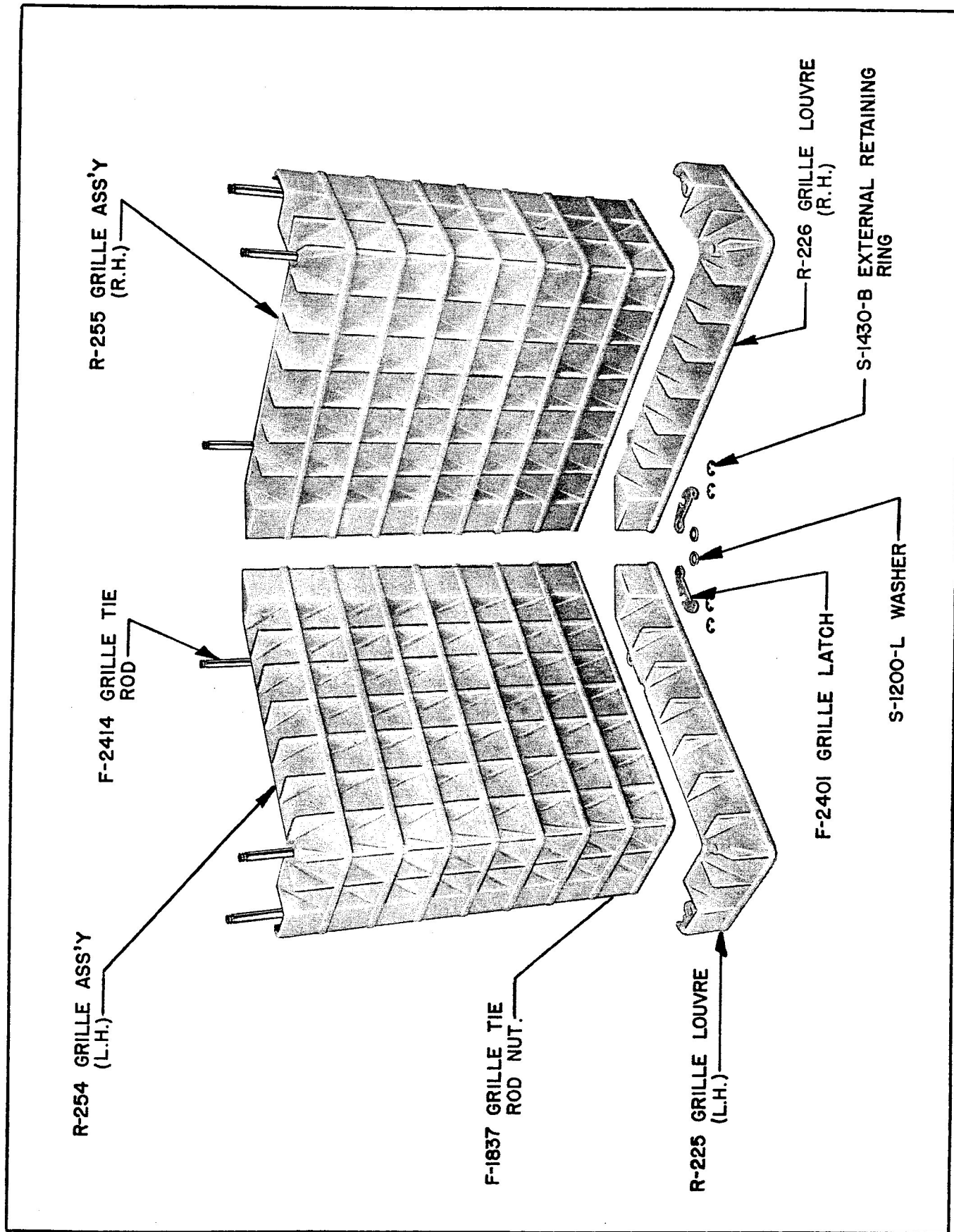


FIG. 9. - GRILLE ASSEMBLY PARTS GROUP

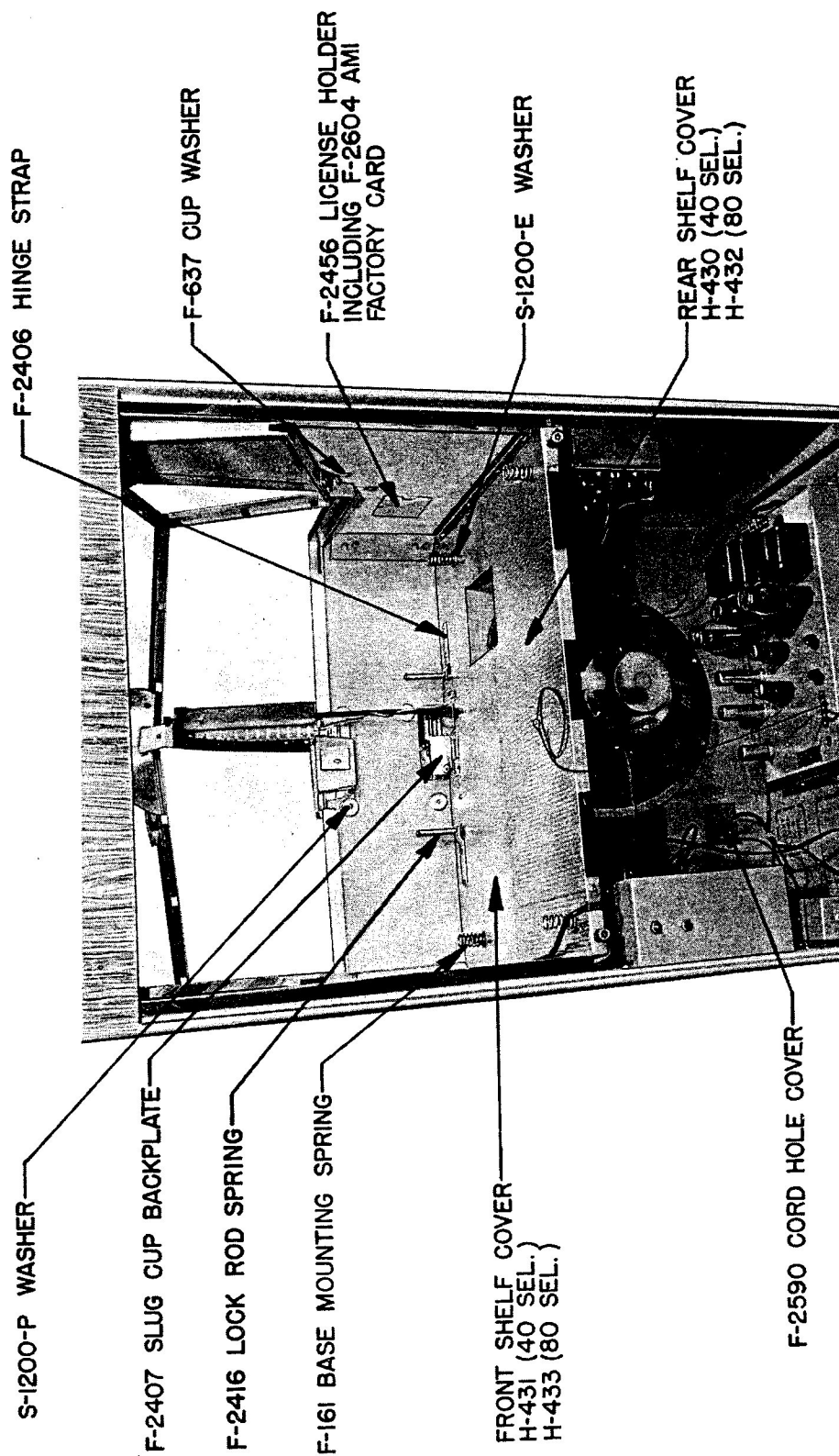
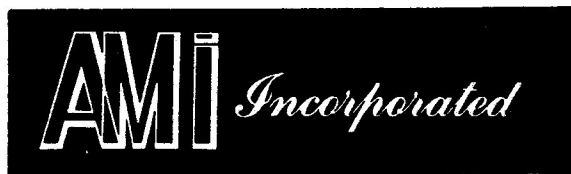


FIG. 12. -- INTERIOR VIEW -- MODEL E-40 AND E-80 PHONOGRAPH

FUNCTIONAL CHARACTERISTICS OF THE MODEL E-80 AND E-120 PHONOGRAPH



**1500 UNION AVENUE, S.E.
GRAND RAPIDS 2, MICHIGAN**

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REVISED MARCH 1, 1954

Every coin operated, automatic phonograph is composed of certain elements which must perform the following basic functions. These functions are described in sequence:

- 1 Register the dropping of coins, converting the coin value to numbers of plays and storing this information to be given up as needed.
- 2 Provide a signal system to allow the customer to choose the title of the music he or she wants.
- 3 Interpret the customer's selection in terms of record position in the record rack.
- 4 Start and search out the selected record.
- 5 Pick up the record, put it on the turntable and place the reproducing device on the record.
- 6 Remove the spent credit from the credit storing device.
- 7 Reproduce the music on the record, amplified to suitable proportions.
- 8 Put the record back in the record rack properly when playing is finished.
- 9 Refer back to the credit storing device to see if there is any credit remaining. If so, repeat the performance. If not, turn itself off.

We believe that the AMI Phonograph accomplishes these functions in a manner which is as simple, straightforward, and foolproof as engineering and materials will allow.

GENERAL INFORMATION

The AMI Model "E" Coin-Operated Phonograph is composed of a cabinet shell embodying the features described in the section entitled "Decorative Features of the Model E Phonograph," a slug rejector, coin switches, selector switches, a credit unit, a record changer mechanism, an amplifier, a loud speaker, and a junction box. For information relative to the mechanism or amplifier, please refer to the proper service manual. The information contained in the following pages describes in detail the purpose and function of the remaining items listed above.

The phonograph is designed to be operated from a line-voltage source of 100 to 125 volts, 60 cycle alternating current *only*. Satisfactory performance will be obtained from a 50 cycle source with the exception that the turntable motor must be modified so that the proper turntable speed will be obtained. This modification is fully described in the mechanism service manual.

OPERATION OF THE PHONOGRAPH

The functional characteristics of the Model "E" Phonograph encompass those components which control the record changer mechanism and the amplifier subsequent

to the inserting of the coins and the pushing of selector buttons. In the following sections all of these are treated beginning with the unit which distributes electrical power, the junction box.

THE JUNCTION BOX

The junction box houses the phonograph control switches, the record cancel pushbutton switch, the DC power supply and all fuses except the fuse in the amplifier. It serves to distribute electrical power, both AC and DC, to the various functioning parts of the phonograph. It houses also the junction box relay mentioned in the section concerning the record changer mechanism.

The 110 volt AC power to the phonograph is controlled by the AC "phono" switch. The two outlets marked "Wall Box" will be energized whenever the "Phono" switch is "on." The "Amplifier" outlet and the "Light" receptacle below it will be on as determined by the condition of the junction box relay. When a record is being played by the record changer mechanism, the junction box relay is not energized, and these two outlets will be turned on. When no selection has been made and the mechanism is at rest, the relay is energized, and the amplifier along with whatever may be plugged into the "Light" outlet will be turned off. The

two center "Light" receptacles become energized when the "Phono" switch is "on" subject to the condition of both the junction box relay and the "Light" switch. When the "Light" switch is "on," the above "Light" outlets are turned on and the action of the relay will have no effect upon them. However, when the "Light" switch is "off," these center receptacles are turned on and off by the junction box relay. When such is the case, the center "Light" outlets will be on whenever a record is playing, and off when the mechanism is at rest. The color lights in the phonograph can be controlled by means of these switching functions whenever it is desirable to do so.

At the rear side of the junction box (toward the front of the phonograph), is located a DC switch intended to be used for servicing purposes only. This switch turns off the DC power. The DC power is normally on at all times when the phonograph is plugged into a power outlet, even when the "Phono" switch is "off." This insures proper registering of credits when coins are dropped into the phonograph when the AC is turned off, and prevents stopping the mechanism in the operation of returning a record to the rack or placing it on the turntable. If it is not convenient to turn off the DC switch while servicing the phonograph, the DC switch on the mechanism junction box may be turned off so that the mechanism will be inoperative.

Immediately below the DC switch is the DC outlet which provides the necessary power for the credit and selection circuits.

Directly below the light switch is located a record cancel pushbutton for rejecting the record being played. This pushbutton switch parallels the reversing switch in the mechanism circuit.

The fuses located in the junction box are as follows:

- 8 ampere cartridge fuse, quick-blow type, for the AC power line.
- 8/10 ampere fusetron, slow-blow type, for the DC mechanism circuit.
- 8/10 ampere fusetron, slow-blow type, for the DC selection and credit circuit.

The slow-blow fusetrans will carry higher currents than their rating for a few seconds. This is necessary to accommodate momentary high currents during starting of the mechanism and operation of reset solenoids, and during operation of the credit solenoid and reset magnet in the credit unit. Each blown fuse should be replaced with one of the proper type and current rating. The current ratings are marked on the junction box and amplifier beside the fuse holders. If possible determine

what caused the fuse to blow, and correct the fault, if it still exists, before replacing the fuse. Protect your equipment. Use **ONLY** the **PROPER** fuse.

The DC power is furnished by the L-13 Transformer-Rectifier Assembly. This unit provides 32 volts maximum open-circuit at the output of the full-wave bridge-type selenium rectifier. If the operation of the mechanism and selector circuits becomes sluggish and uncertain, this unit should be examined on the AMI Master Analyzer at the office of your AMI Distributor.

For tracing circuits in the junction box, see the Schematic Diagram of the Selection, Credit, Mechanism and Junction Box Circuits, Figure 5. For the wiring diagram of the Phonograph Junction Box, please refer to Figure 3.

SLUG REJECTOR AND COIN SWITCH ASSEMBLY

The slug rejector and coin switch assembly is mounted at the front of the mechanism shelf. It is held in place by means of an "L"-shaped hook which is mounted in the front trim casting. The unit may be lifted straight upward and locked in a raised position by turning the rejector outward.

The slug rejector serves to reject improper coins or slugs and direct them into the coin return chute enclosed in the front panel directly below the coin entrance, and to segregate nickels, dimes, and quarters so that they will pass from the rejector by means of separate exit slots, one for each of the three denominations. As a coin falls from the slug rejector, it strikes the actuating arm of one of the three coin switches, and passes through the coin chute into the cash box of the phonograph. The momentary closure of a coin switch will energize an appropriate circuit in the Credit Unit and thus establish the proper amount of credit.

The Model E employs the standard Model NDQ 4906 slug rejector manufactured by National Rejectors, Inc., St. Louis 15, Missouri. Detailed instructions for the adjustment of this slug rejector are furnished in a brochure published by National Rejectors, and which may be obtained from them or from your AMI Distributor. Maintenance required is slight. Keep it clean, particularly the magnet faces to which metal particles may cling.

The Coin Switch Assembly consists of three separate blade switch elements. The contacts affixed to each set of blades are closed by the action of a coin falling onto the actuating arm. The air gap between the contacts should be 1/32 inch at the time that the actuating arms are touching the slug rejector. The long contact blade must press against the arm with sufficient force to hold

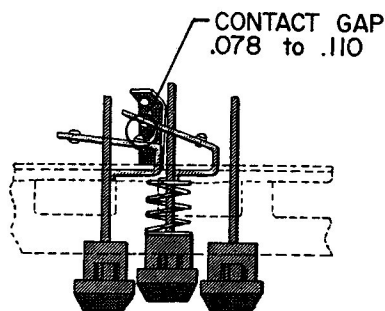
it against the slug rejector. However, this force must not be so great that a coin will fail to fall through the switch. This adjustment may be checked as follows: Place a finger beneath the actuating arm and hold it up to the slug rejector. Then drop the proper coin into the rejector. The coin will be caught on the switch. Release the actuating arm of the switch by slowly removing your finger. The weight of the coin should be sufficient to depress the arm, thus closing the contacts and allowing the coin to fall clear of the slug rejector. In the event that this adjustment cannot be made by reducing the tension of the long blade without allowing the actuating arm to fall free of the slug rejector, reduce the tension of the short contact blade against the stiffener blade which positions it.

SELECTOR SWITCH, TERMINAL BOX, AND HARNESS ASSEMBLY

The selector switch, terminal box and harness assembly is an integral part of the program panel. It provides the selector pushbutton switches and connects them with the selector magnet banks on the record changer mechanism and with the credit unit. In addition, connections to the selector magnet banks are carried to the 24-connector Jones Receptacles marked "C" and "D" in the terminal boxes for connection to a remote control system.

Terminal number 21 in all "C" receptacles is DC positive (+), and terminal number 24 is DC negative (-). When a circuit is closed between terminal 21 and any of the terminals numbered 1 through 20 in the corresponding "C" and "D" receptacles, the related selector magnet will be energized. On an 80-selection phonograph receptacle "C" in the left-hand terminal box is connected to selector magnets 1 through 20, "D" to magnets 21 through 40. In the right-hand terminal box, "C" connects to magnets 41 through 60, and "D" to 61 through 80. On 120-selection equipment, one "C" receptacle and the "D" receptacle in the left-hand terminal box are connected the same as in 80-selection phonographs. The second "C" receptacle connects to magnets 41 through 60. In the right-hand box one "D" receptacle connects to magnets 61 through 80, "C" to magnets 81 through 100, and the remaining "D" to magnets 101 through 120. The selector magnets are connected so that record number 1 provides selections 1 and 2, record number 2 has selections 3 and 4, etc.

For tracing wires, refer to the Wiring Diagrams for the Selector Switch, Terminal Box and Harness Assembly, Figures 6, 7, 8, and 9, or to the Schematic Diagram of the Selection, Credit, Mechanism, and Junction Box Circuits, Figure 5, whichever is appropriate.



1. WITH PUSHBUTTON COMPLETELY DEPRESSED, BEND BRASS CONTACT BRACKET UP AND AWAY FROM CORRESPONDING CONTACT SPRING AS SHOWN ABOVE.

BEND CONTACT SPRING TO OBTAIN .078 to .110 INCH GAP BETWEEN NORMALLY CLOSED CONTACTS.

2. AFTER RELEASING PUSHBUTTON, BEND BRASS CONTACT BRACKET TOWARD CONTACT SPRING TO OBTAIN .040 to .050 INCH GAP BETWEEN NORMALLY OPEN CONTACTS AS SHOWN BELOW.

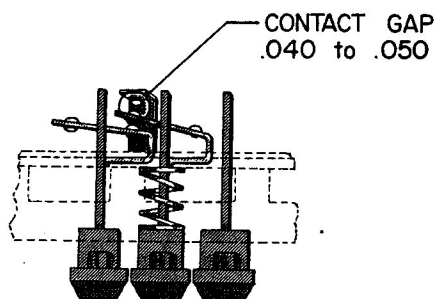


FIG. 1. - PUSHBUTTON SWITCH ADJUSTMENT

CREDIT UNIT

The Credit Unit performs two functions essential to the operation of the phonograph. First it provides a means of remembering the credit value of coins deposited in the coin slot. Second, for each credit thus established by coins, it furnishes a circuit closure of an appropriate time length to energize a selector magnet when a selector switch button is pushed.

A toothed credit wheel in the unit serves as a mechanical memory for the number of credits established. It is continuously under spring tension which attempts to rotate it to a home (*no credit*) position. At this position a blade switch, called the main credit switch, is held open by a pin on the wheel.

When a coin passes through the slug rejector it causes a coin switch to close momentarily. This permits current to flow through a solenoid. A plunger in this solenoid moves, actuating a pawl which engages the credit wheel, rotating it away from its home position. This permits the main credit switch to close. The number of wheel tooth spaces by which the pawl moves the wheel is equal to the proper credit value of the coin. For the quarter (25¢) the movement of the pawl is limited by a fixed stop. For the nickel a movable stop is caused to move into the path of the pawl by the same current which energizes the solenoid. For the dime a second movable stop, actuated similarly to the nickel stop, limits the movement of the pawl. The credit wheel is held in the position to which it is moved by an escapement. It cannot return toward its home position except when the escapement is moved. As additional coins are dropped into the coin slot of the phonograph the credit wheel is rotated further from its home position by the number of tooth spaces equivalent to the total credit value of the coins. A resistor, connected across the solenoid, serves to prolong the action of the solenoid plunger after the coin switch contacts reopen.

As sent from the factory the credit unit gives one play for a nickel, two plays for a dime and five plays for a quarter. Changes which cause the unit to give six plays for a quarter or one play for a dime and three plays for a quarter can be made easily and quickly (see *Figure 2*).

With credit established and the main credit switch closed, the unit is in the proper condition to make selections. When a selector switch button is pushed, a circuit is closed through the corresponding selector magnet on the phonograph mechanism. This circuit also

includes the main credit switch, a set of relay contacts and the reset magnet which operates the escapement.

Simultaneously, the selector magnet pulls down the selector finger, making the selection, and the reset magnet rotates the escapement, permitting the credit wheel to return one tooth space toward its home position. The movement of the escapement closes a pair of contacts of the reset switch energizing the relay whose contacts are in the selection circuit just mentioned. The relay contacts open, interrupting the selection circuit. The circuit stays open until the selector switch button is released. This is accomplished by causing the relay to remain energized through a resistor as long as the selector switch button is held down.

The length of the closure of the selection circuit is sufficiently long to trip one selector finger but is not long enough to trip two in succession. This remains true over the entire range of operating voltages which may be encountered in actual operation.

As more selector switches are operated, the selection cycle as described repeats. This continues until credit is exhausted and the movement of the wheel when the last selection is made causes the main credit switch to open. Further pressing of the selector switch buttons cannot close the selection circuit. The relay operates, however, energized through the resistor as described. This operating of the relay is incidental to the functioning of the unit, and occurs for purposes of circuit convenience.

The main credit switch assembly incorporates a second set of contacts which turn on the "Select" or "Credit" light whenever credit has been established in the Credit Unit. These contacts open, turning off the "Select" light when the last credit is removed and the credit wheel moves to home position.

Please refer to the "Credit Unit Cycle of Operation" diagrams on pages 8 through 9 for a step by step description of Credit Unit operation.

MAINTENANCE

Normally, the credit unit requires no maintenance. Periodic checking of the adjustments as described in the following section and of the tightness of screws and nuts is recommended in order to prevent possible malfunction. **DO NOT LUBRICATE.** Oil will interfere with certain operations, particularly the movement of the stop plungers.

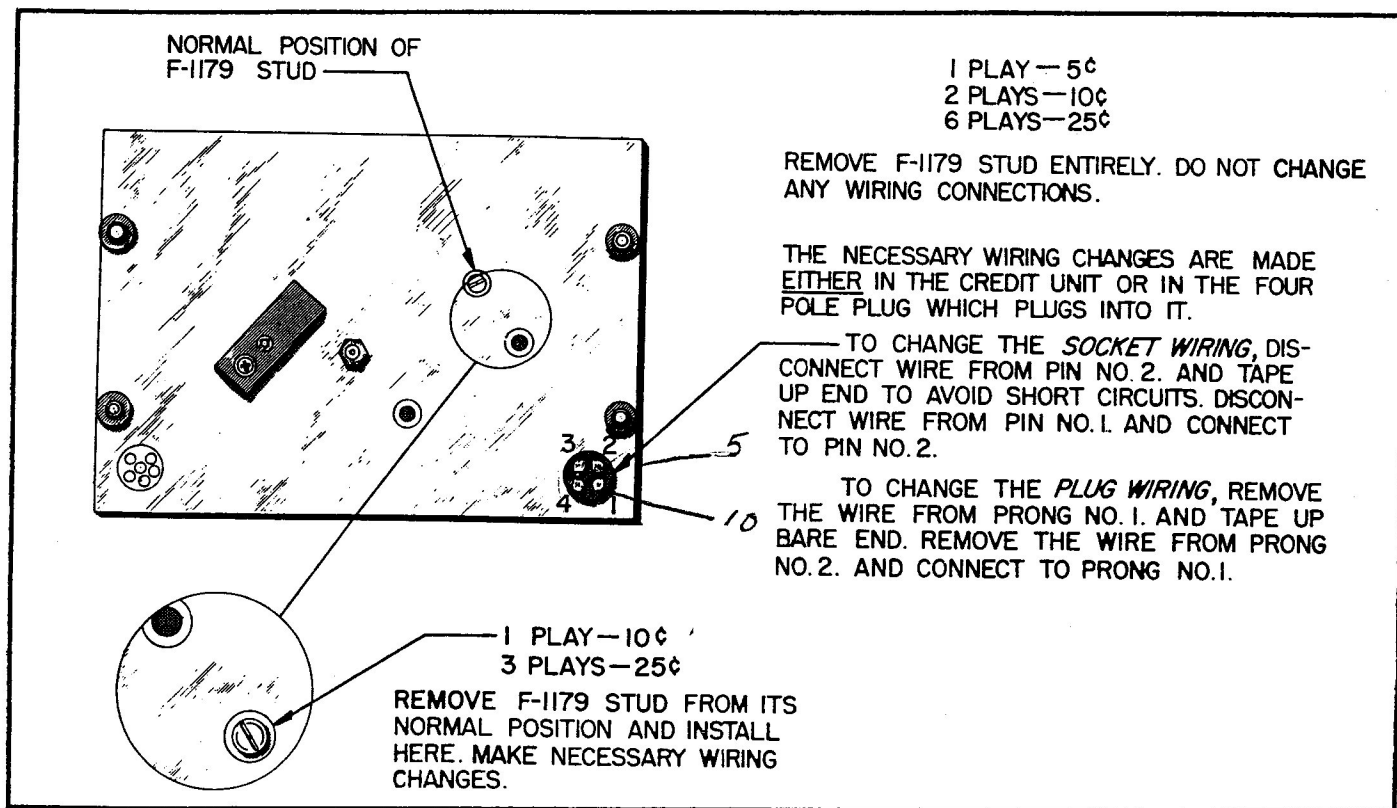


FIG. 2. — CHANGE OF CREDITING

ADJUSTMENTS

In some cases one adjustment depends upon the correctness of another; consequently, when checking the adjustments or readjusting the unit, follow the sequence indicated below.

Credit Wheel

The credit wheel should be free to rotate and to move slightly when rocked in the direction of its shaft. If adjustment is necessary, loosen the lock nut on the shaft, turn the shaft until it starts to tighten against the credit wheel, turn back 1/4 turn and tighten the locking nut.

Escapement and Shaft

The escapement, when pushed against the reset magnet and released, should permit the credit wheel to return one tooth space toward its home position. There should be no position of the escapement where the wheel can "slip by" more than one tooth at a time. Adjust the escapement toward the credit wheel by moving the escapement adjustment about its pivot until the wheel will

not escape properly, and then back the escapement away just sufficiently to permit proper operation at all positions of the wheel from full credit to no credit.

Reset Magnet

Both reset magnet faces should touch squarely the plastic tape on the escapement when the escapement is pulled against it. At the same time, the lower tooth of the escapement should be completely to the bottom of the tooth space on the credit wheel. Adjust by moving the reset magnet in its mounting slots.

Reset Switch

When the escapement is held at the position where the upper tooth has just released the credit wheel, the contacts of the reset switch should show a .010 to .015 inch gap. When the escapement is moved toward the reset magnet until its top tooth is just about clear the credit wheel tooth and the escapement is then released, the force of the reset switch alone must return the point of the upper escapement tooth to the root of a credit wheel tooth space. This must also be true at a position of the credit wheel representing zero credit.

Main Credit Switch

When the credit wheel is in a position representing one credit, and the escapement is then pulled against the reset magnet and held there, there should be a minimum of .001 inch clearance between the fiber insulating sleeve and the long blade of the switch. With the wheel in a zero credit position, the adjacent contact blade should not touch the fixed stop blade, and the contact gap should be .010 inch minimum.

Assembly of Stops

The lower edge of the pawl should rest on the lower leg of the mounting bracket for the assembly of stops. The entire edge of the pawl need not be in contact with the mounting bracket, but the clearance at the end of the pawl nearest the credit wheel should not exceed .010 inch. The solenoid may be raised upward or downward in its mounting slots to perform this adjustment (See *paragraph on solenoid below*). When the solenoid plunger is pushed upward, the point of the pawl should move directly to a point on the face of a tooth which is from .005 inch to .010 inch away from the bottom of a credit

wheel tooth space. For this check the upper tooth of the escapement must engage the credit wheel normally. Adjust by loosening the screws holding the assembly of stops and moving it in the mounting slots.

Solenoid

The solenoid should be closer than .010 inch to the pawl lever but not actually against it. It must not support the pawl lever so as to raise the lower edge of the pawl from the leg of the bracket of the assembly of stops at any point.

LOUDSPEAKERS

The Phonograph Speaker

The loudspeaker furnished with the phonograph is a heavy duty 15 inch permanent magnet type, and has a voice coil impedance of 16 ohms. It is mounted securely to the rear of the speaker baffle by means of wood screws. For complete information concerning multiple speaker installation, please refer to the amplifier service manual.

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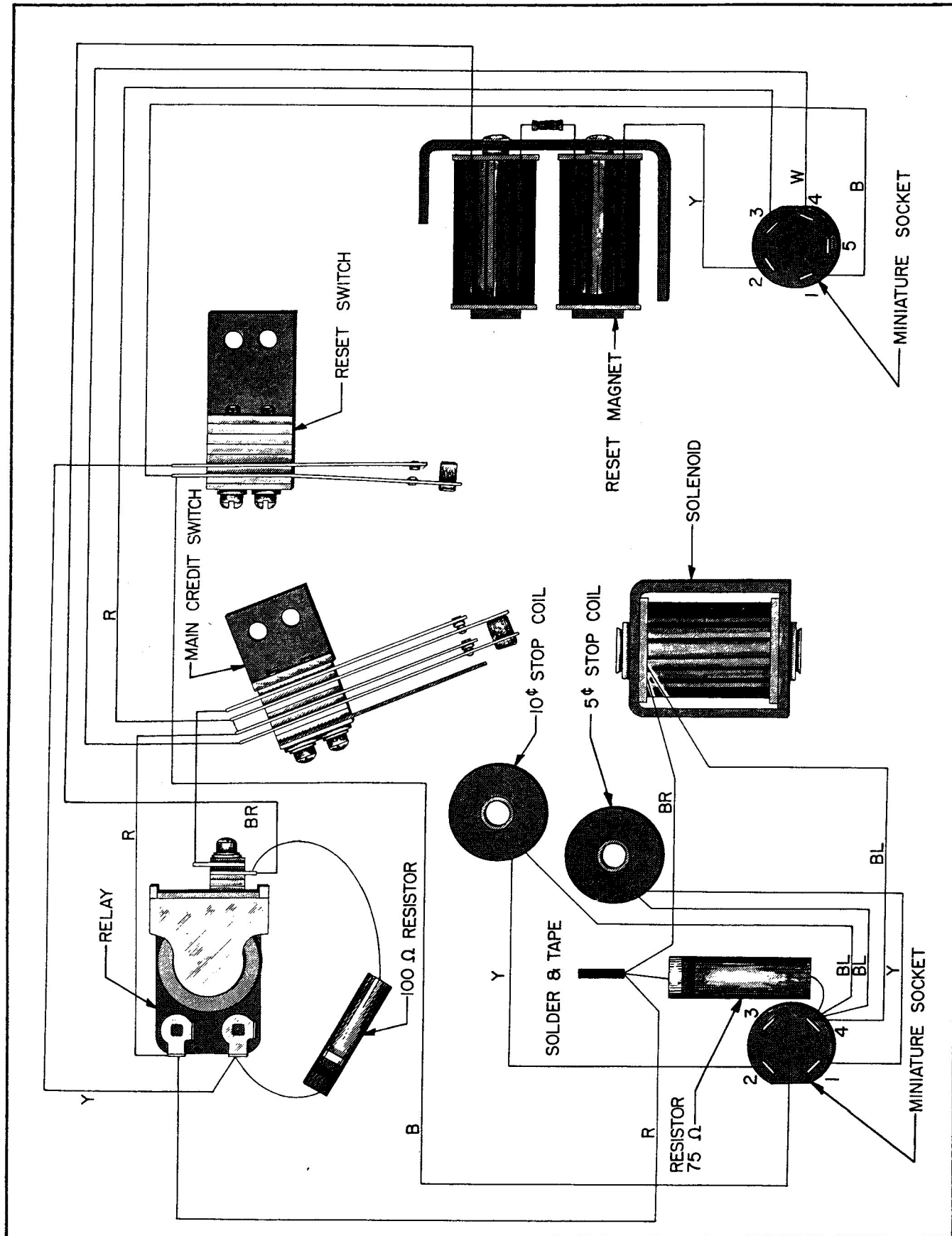
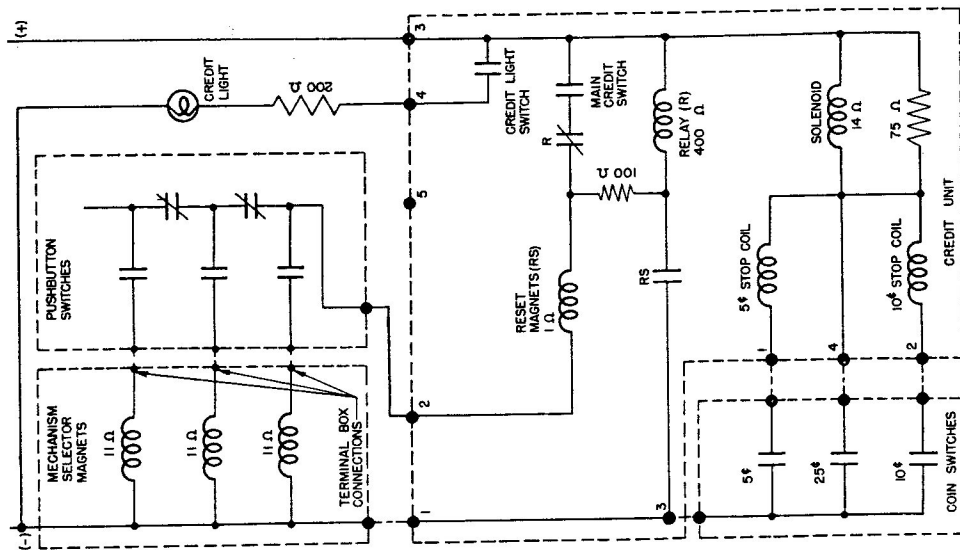
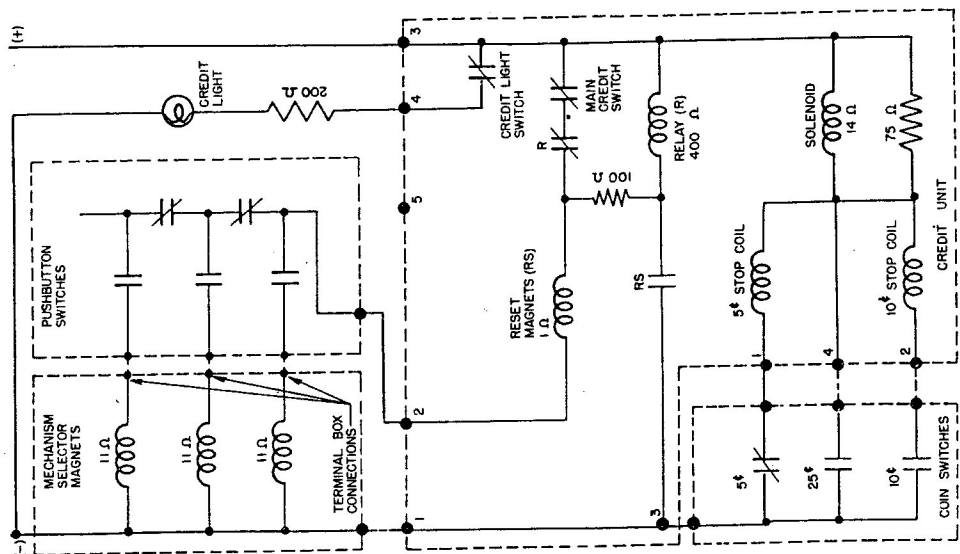


FIG. 3. -- WIRING DIAGRAM -- MODEL E CREDIT UNIT



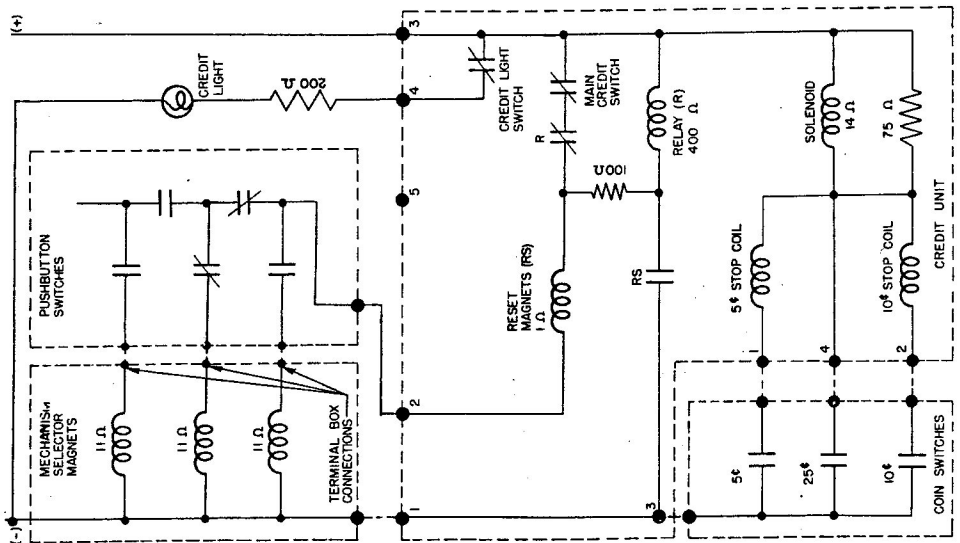
NO. 1. NORMAL CONDITION

Main credit switch is open. No current flows.



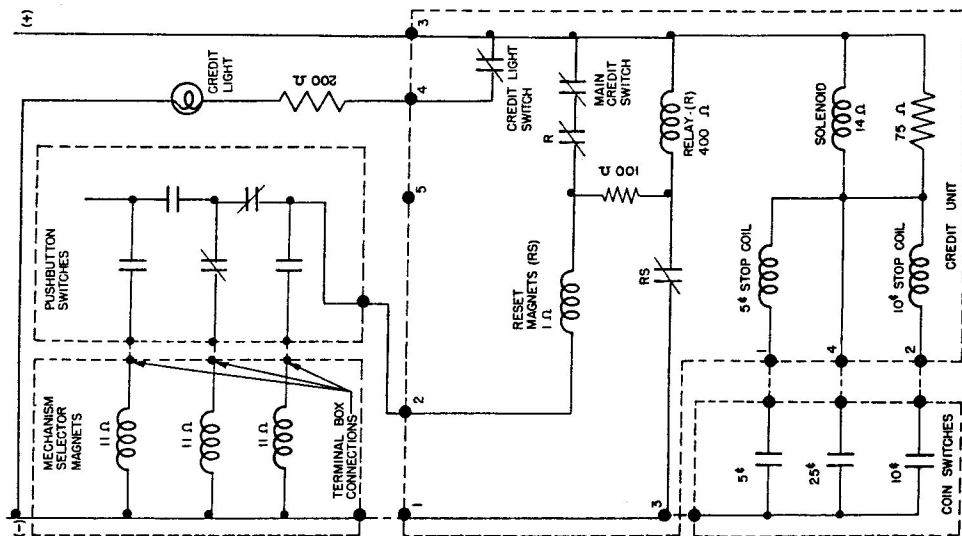
NO. 2. ESTABLISHING CREDIT

Nickel passing through slug rejector closes (5¢) coin switch. (5¢) stop coil is energized, moving (5¢) stop. Solenoid is energized, moving plunger which causes pawl to rotate credit wheel one tooth. Main credit switch closes. As coin switch opens, plunger action is prolonged by 75 ohm resistor. Credit light switch closes, illuminating select light. Red lines indicate current flow.



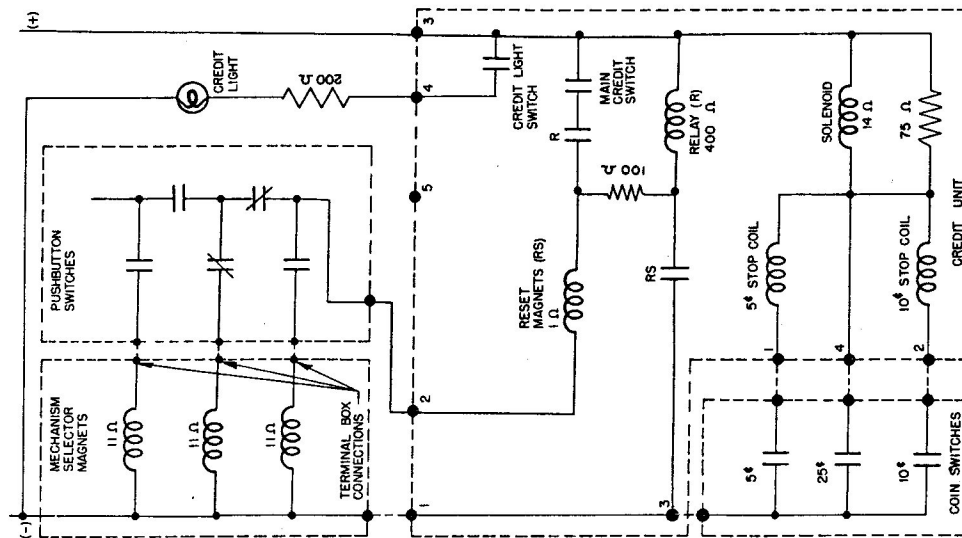
NO. 3. CHOOSING SELECTION

Operation of pushbutton switch energizes selector magnet and reset. Selector finger starts to trip and escapement starts to move.



NO. 4. MAKING SELECTION

Escapement moves to reset magnet and closes contact RS, energizing relay. Current through selector magnet and reset continues. Selector finger trips.



NO. 5. REMOVING CREDIT

As relay picks up, relay contact R opens, interrupting selection current through reset magnet. Escapement moves away from magnet, opening contact RS and moving credit wheel one tooth. Fiber pin on wheel opens main credit switch and credit light switch. Relay remains energized, holding contact R open, until pushbutton is released, when unit returns to normal as shown in diagram No. 1.

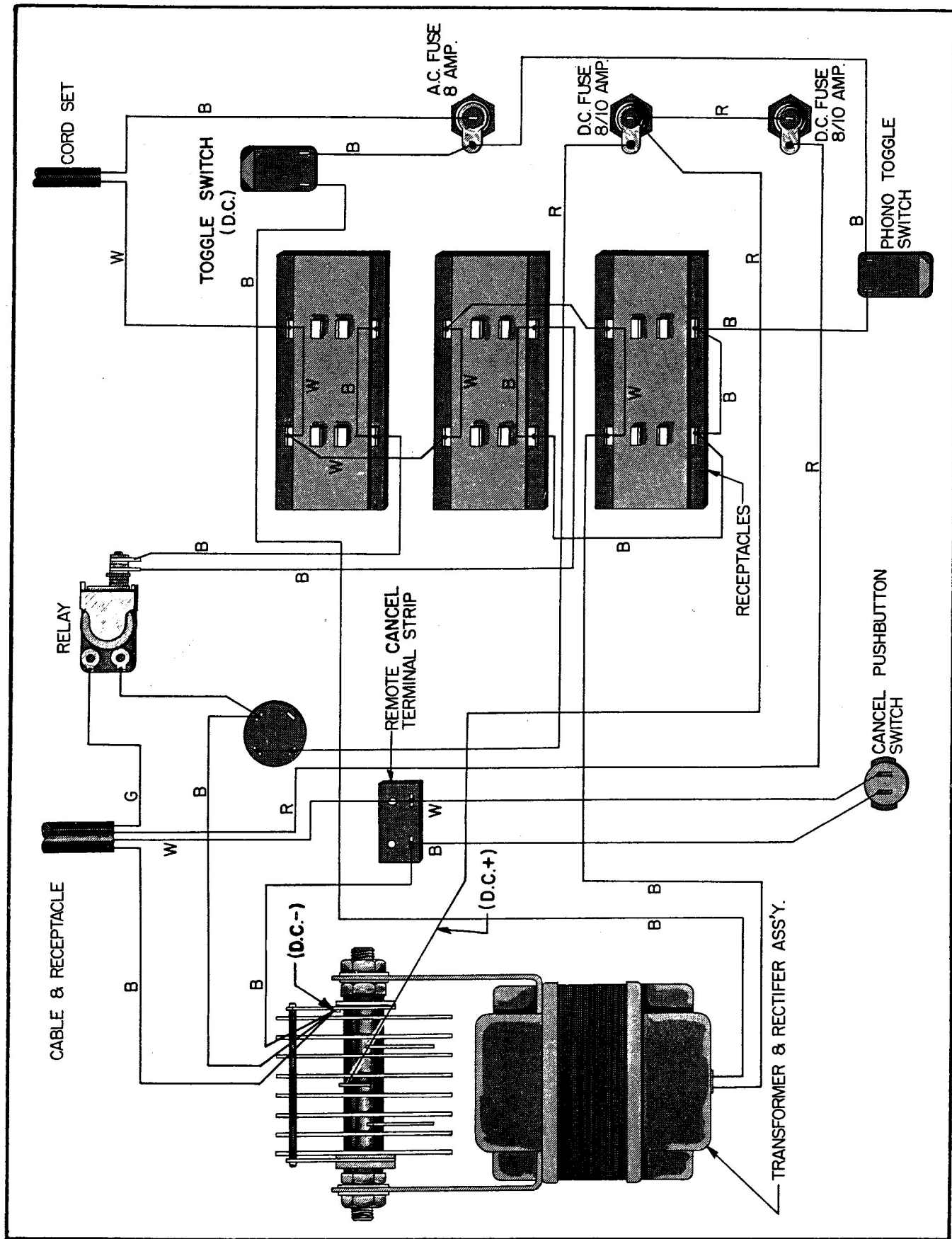


FIG. 4. - WIRING DIAGRAM - PHONOGRAPH JUNCTION BOX

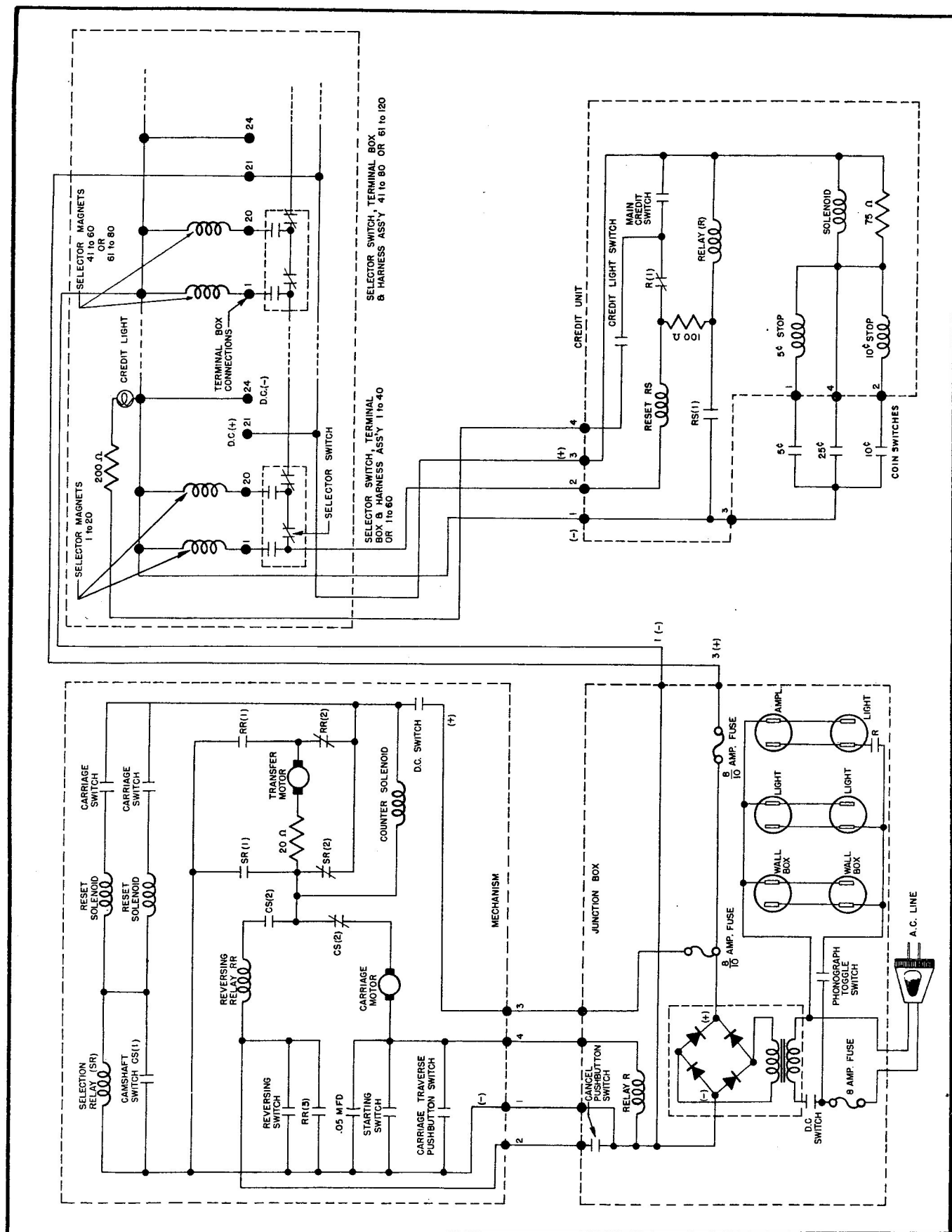


FIG. 5 - SCHEMATIC DIAGRAM - SELECTION, CREDIT, JUNCTION BOX, AND MECHANISM CIRCUITS



FIG. 7. -- WIRING DIAGRAM -- SELECTOR SWITCH, TERMINAL BOX, AND HARNESS ASSEMBLY, SELECTIONS 41-80, MODEL E-80

PUSHBUTTON SWITCH BANKS

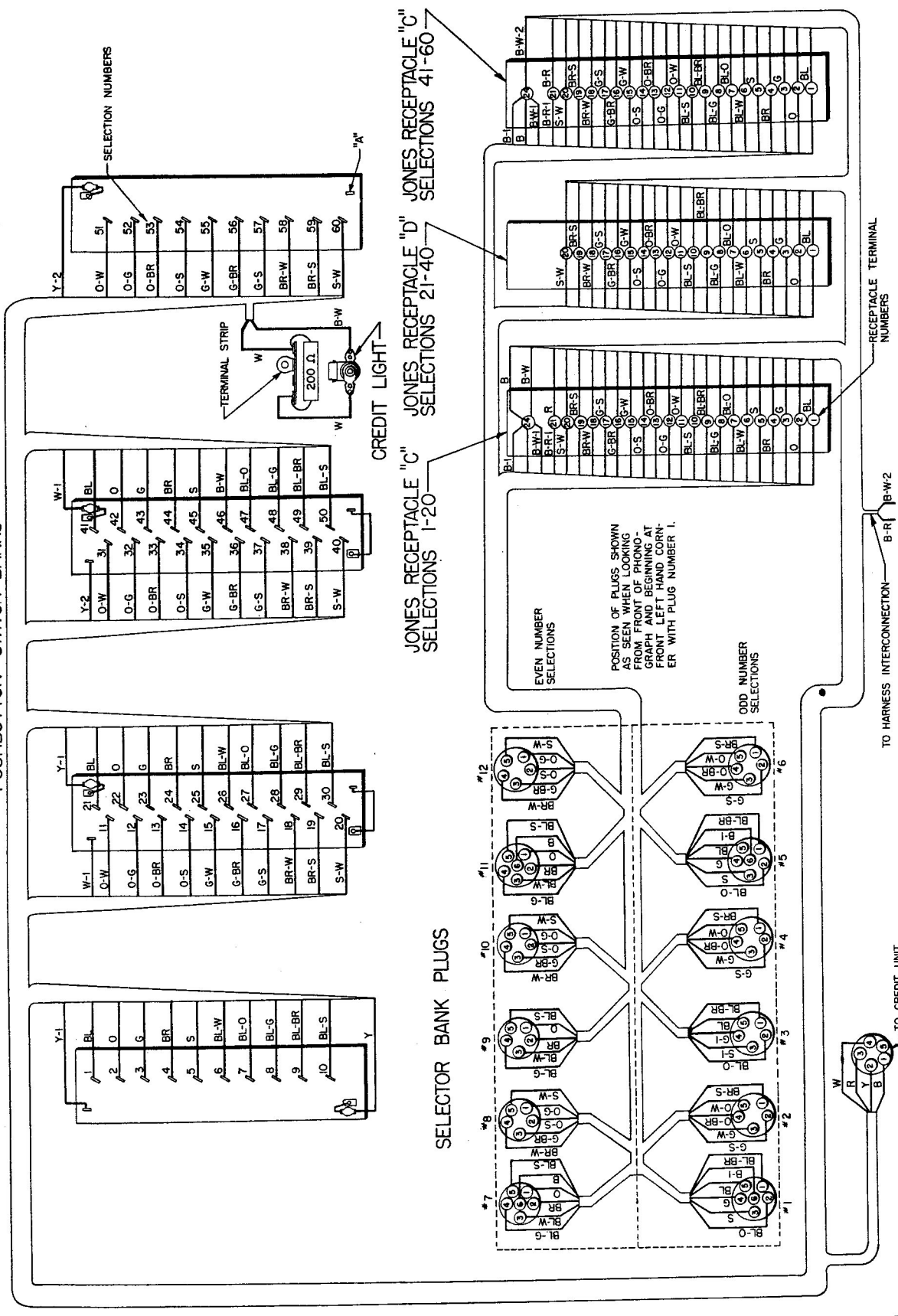


FIG. 8. - WIRING DIAGRAM - SELECTOR SWITCH, TERMINAL BOX, AND HARNESS ASSEMBLY, SELECTIONS 1-60, MODEL E-120

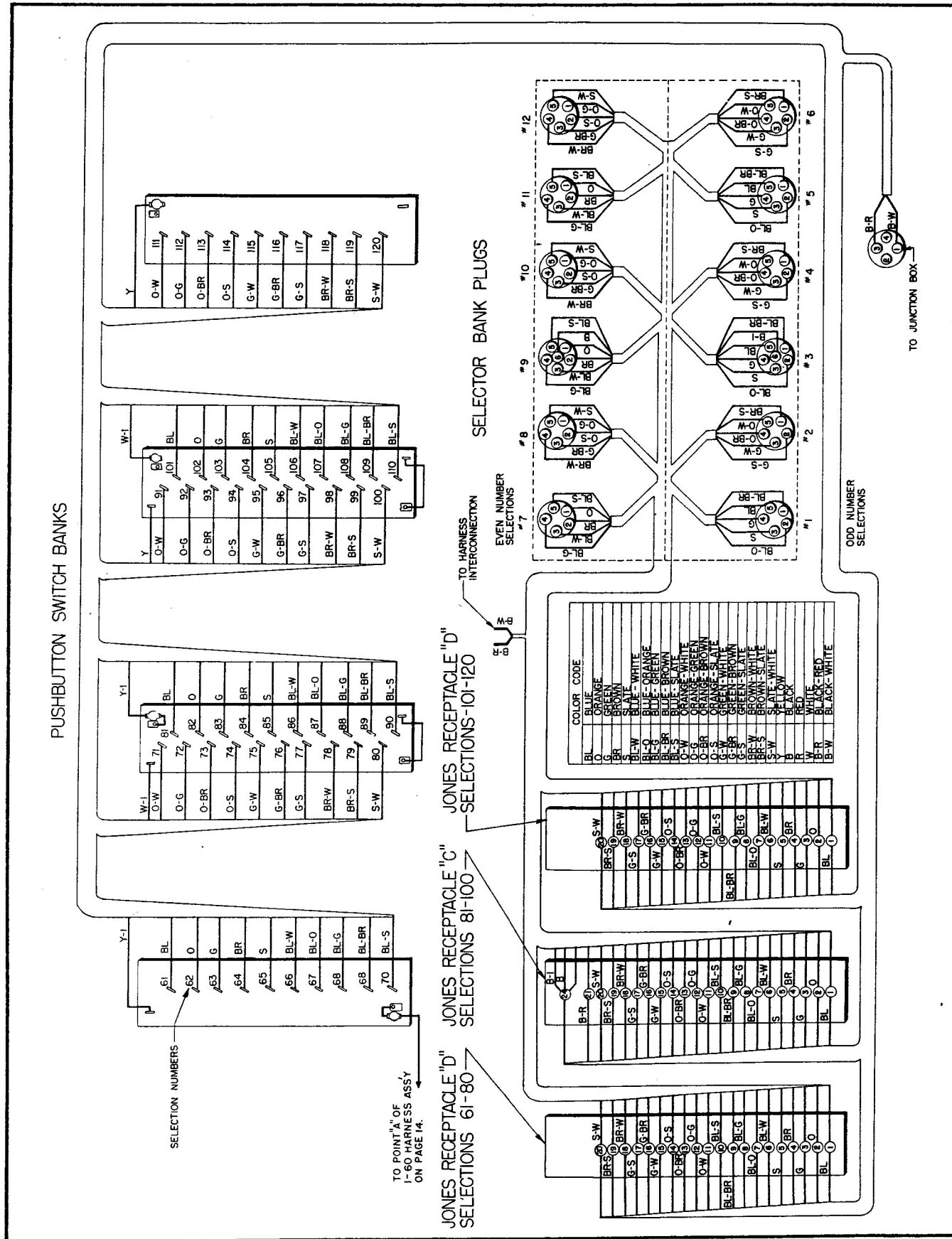


FIG. 9. -- WIRING DIAGRAM -- SELECTOR SWITCH, TERMINAL BOX, AND HARNESS ASSEMBLY, SELECTIONS 61-120, MODEL E-120

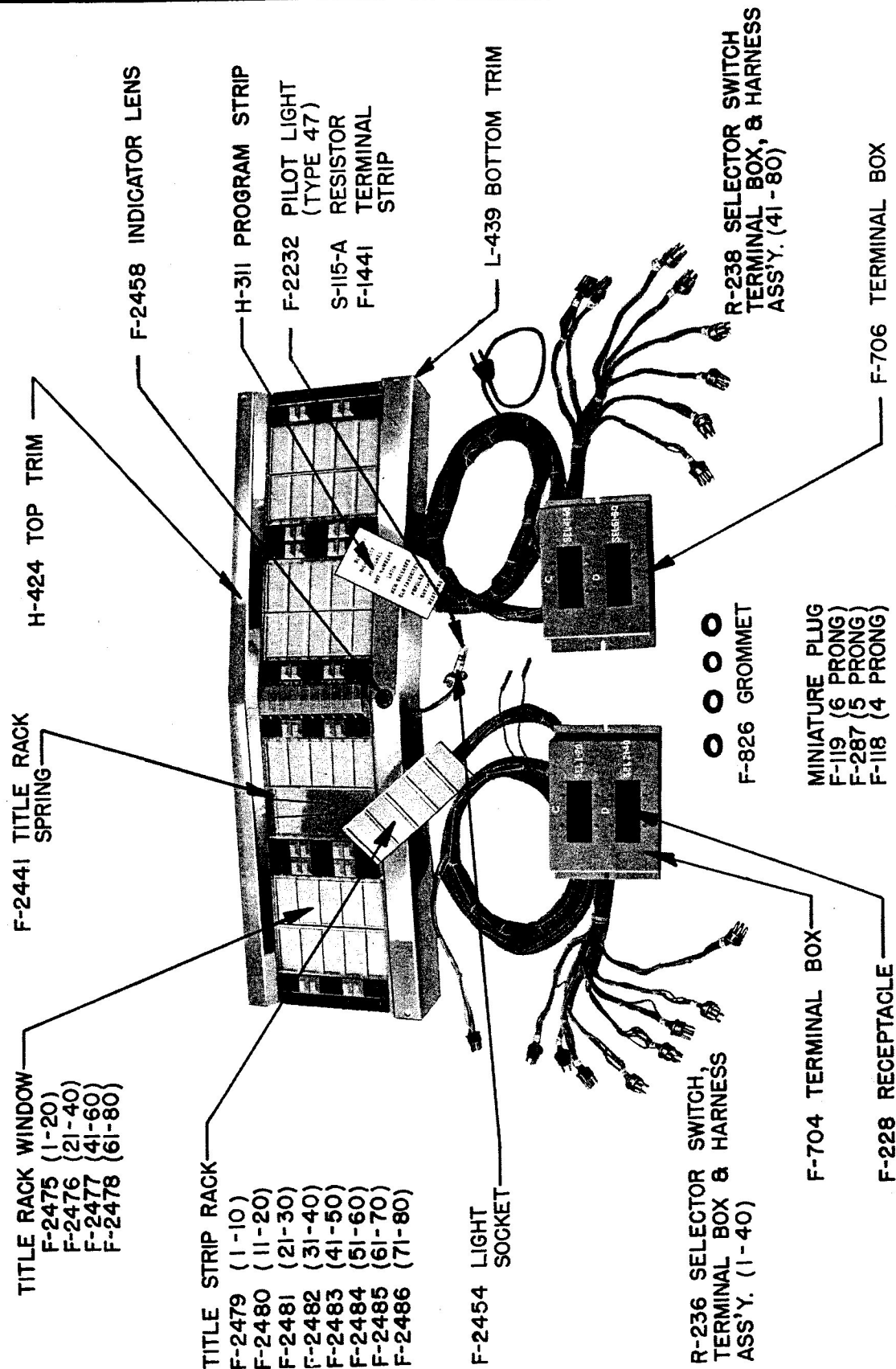


FIG. 10. - SELECTOR PANEL ASSEMBLY, MODEL E-80

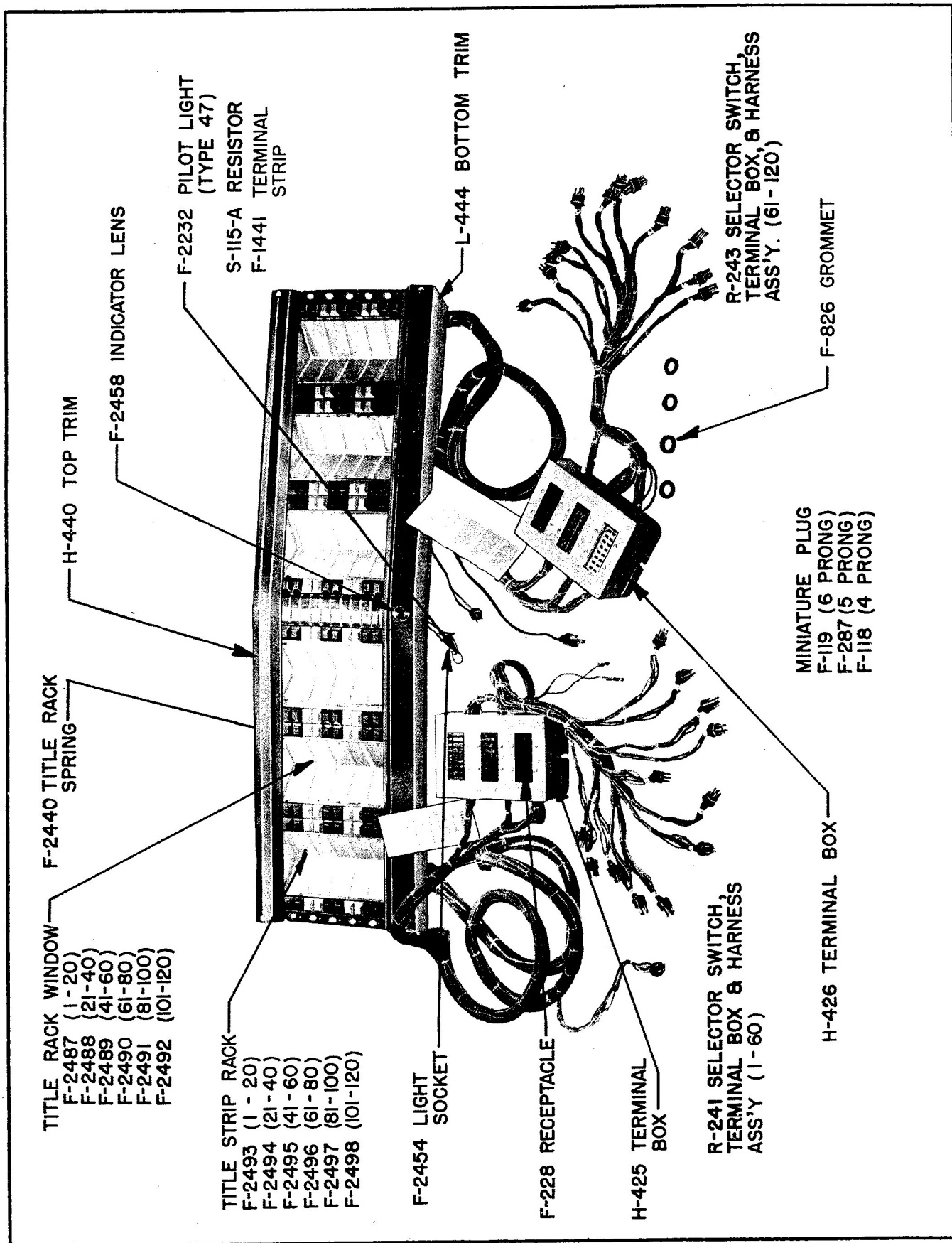


FIG. 11. - SELECTOR PANEL ASSEMBLY, MODEL E-120

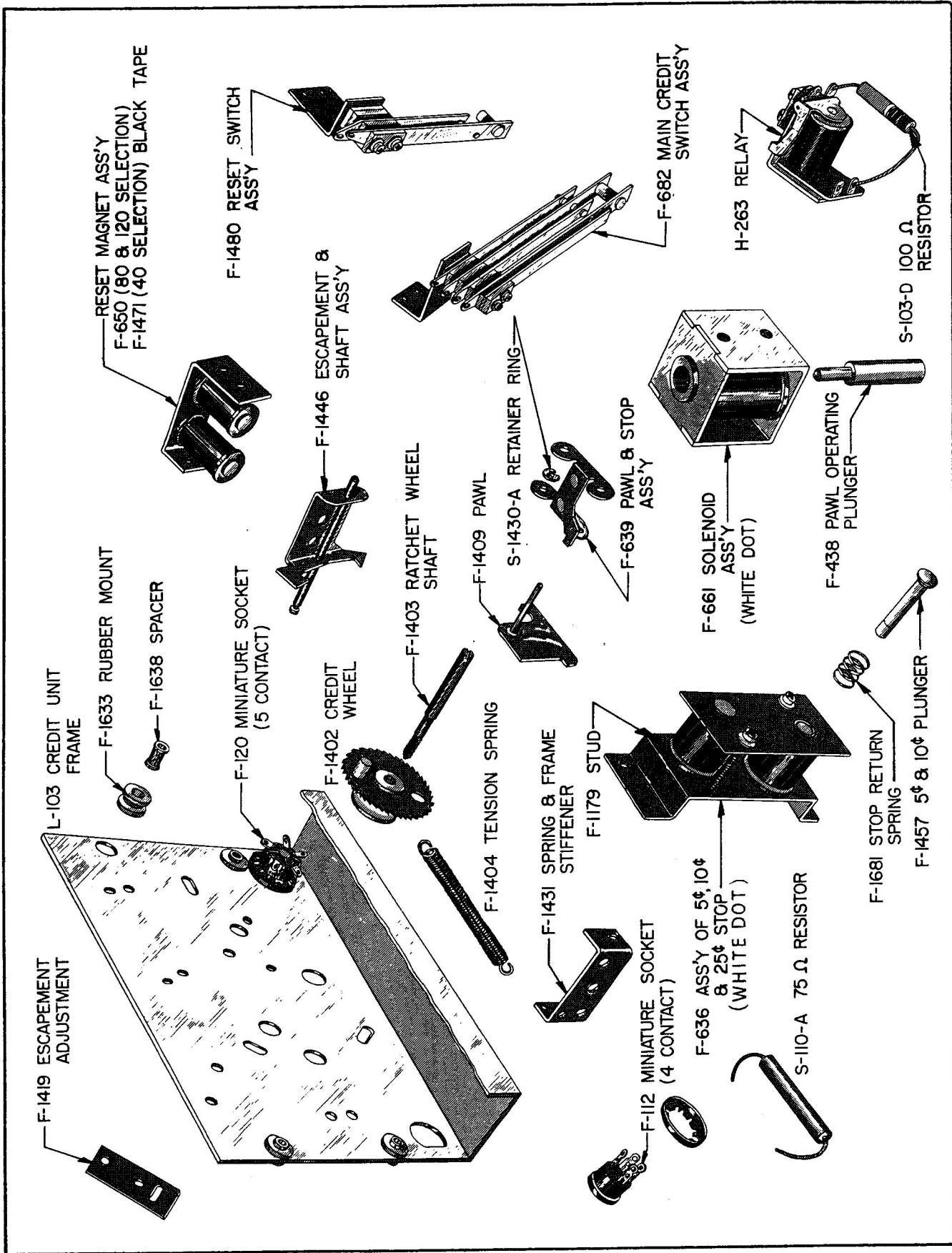


FIG. 12. - CREDIT UNIT PARTS GROUP

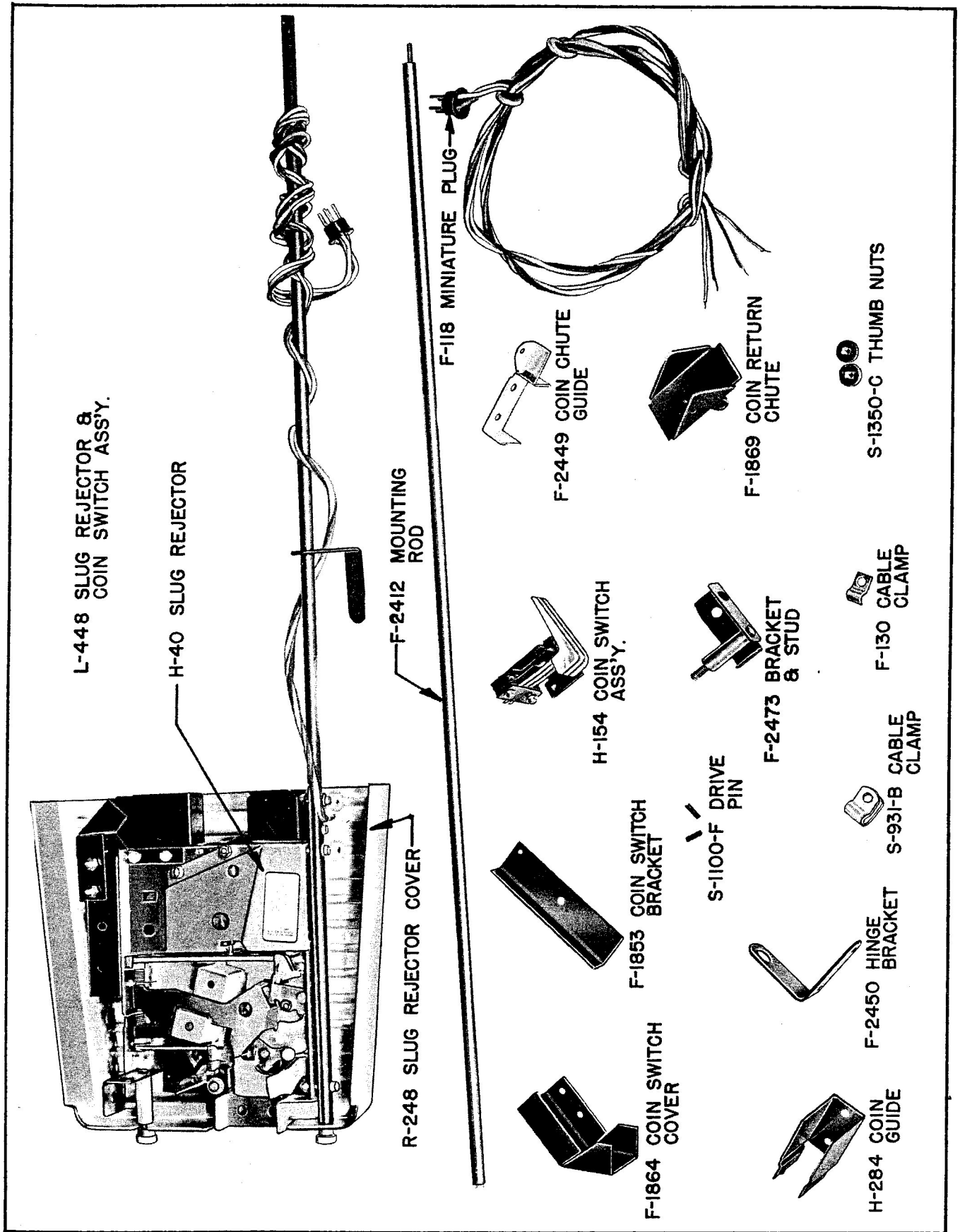


FIG. 13. - SLUG REJECTOR AND COIN SWITCH PARTS GROUP

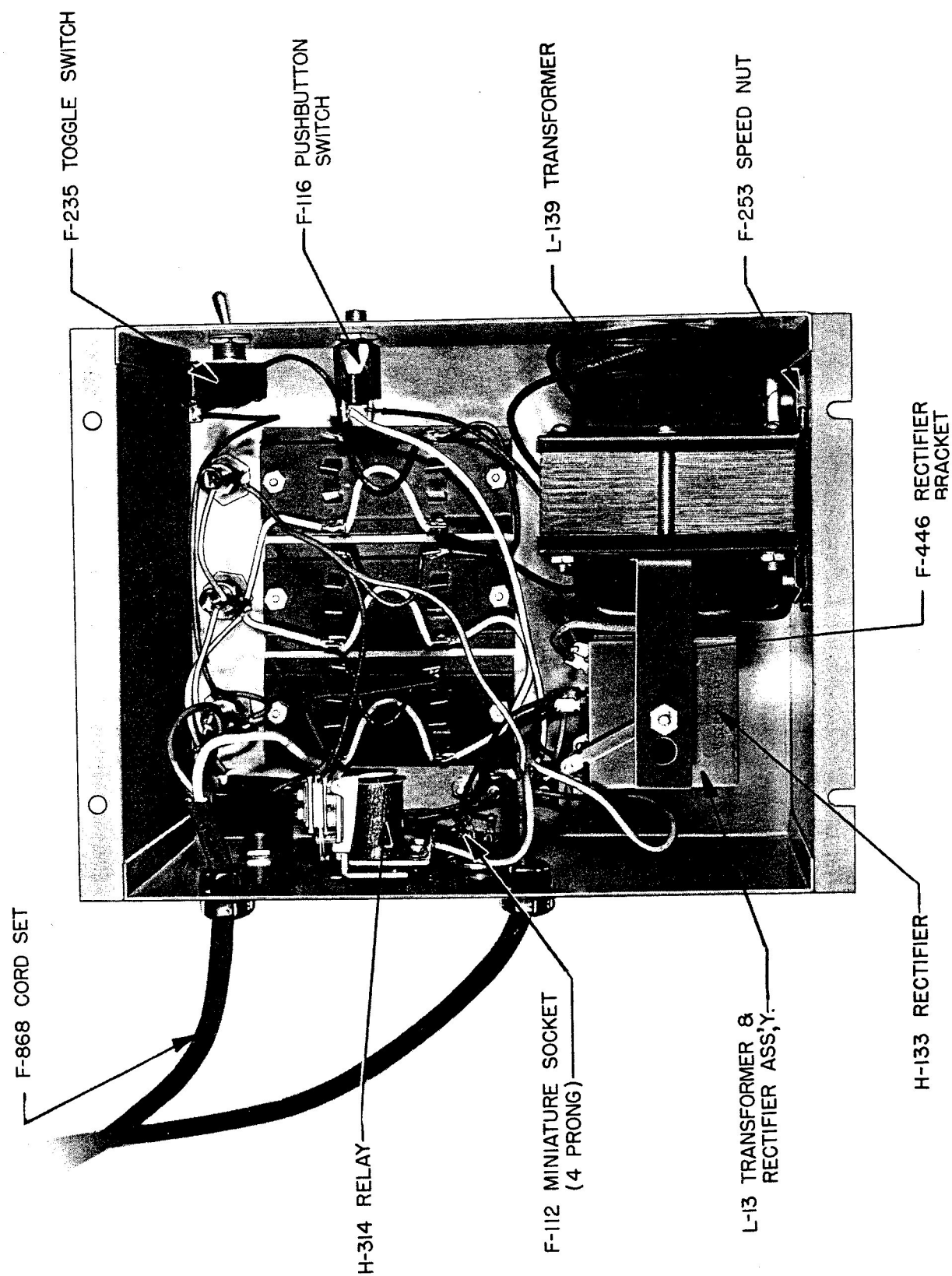


FIG. 10. - JUNCTION BOX ASSEMBLY - REAR VIEW

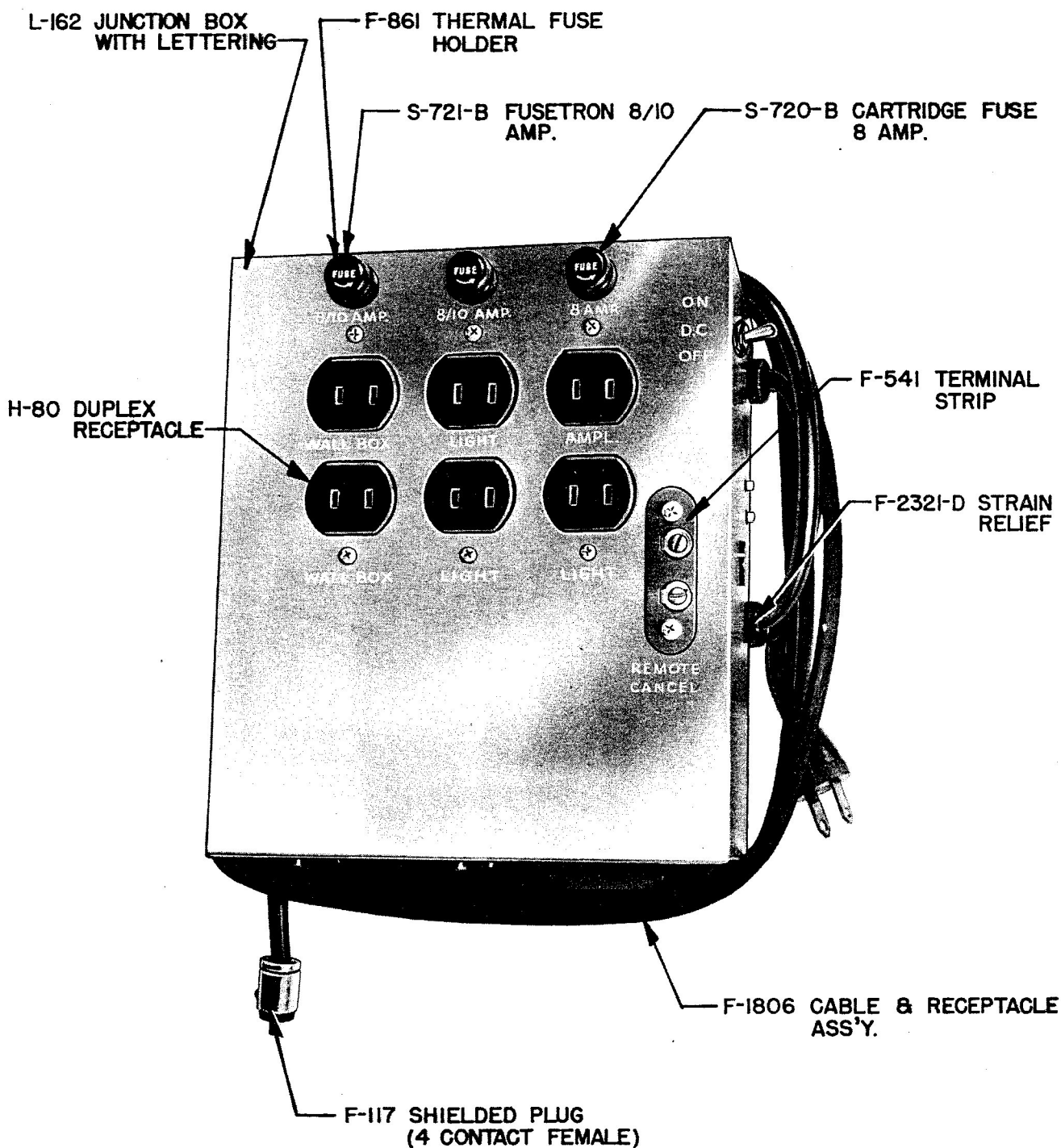


FIG. 14. - JUNCTION BOX ASSEMBLY - FRONT VIEW

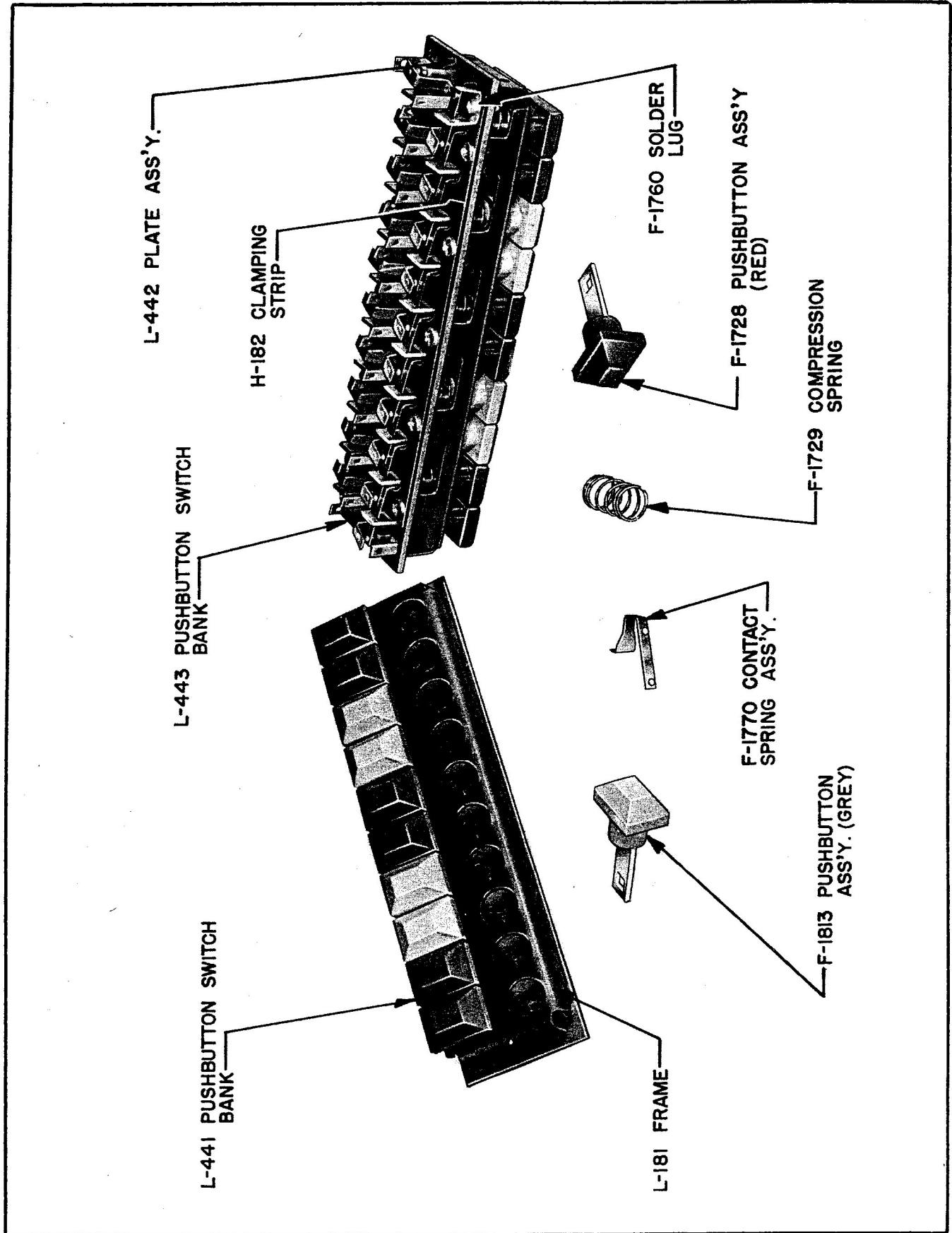


FIG. 16. - PUSHBUTTON SWITCH BANK ASSEMBLY

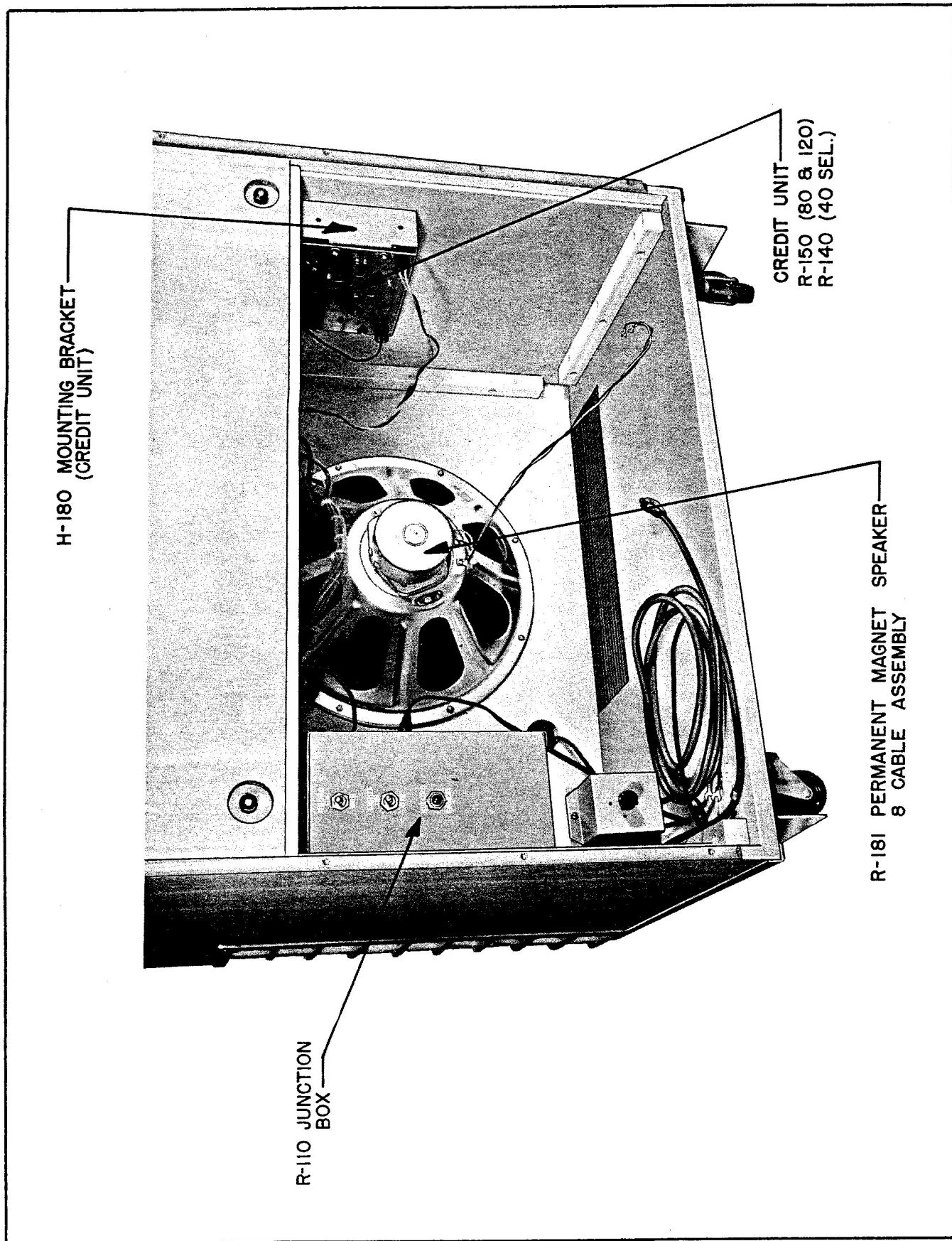
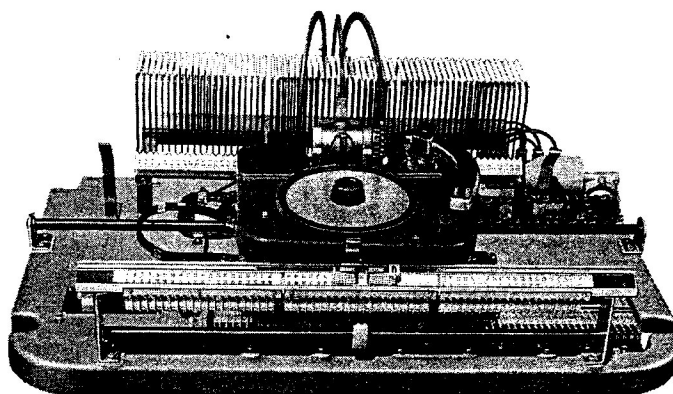


FIG. 17. - REAR VIEW - MODEL E PHONOGRAPH

R-484 and R-520 MECHANISM SERVICE MANUAL



AMi *Incorporated*

**1500 UNION AVENUE, S.E.
GRAND RAPIDS 2, MICHIGAN**

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BASIC OPERATION

Selections are transmitted to the mechanism through the operation of the credit unit, as described in the section entitled "Functional Characteristics of the AMI Phonograph". When a selector switch button is pressed, the credit unit will energize the related selector magnet coil of the selector assembly, drawing one end of the corresponding selector finger against the magnet. The finger is held in its position against the magnet core by the action of a flat spring. As a finger is tripped, the opposite end will rise, lifting the bail wire which pivots at both ends of the selector frame. (See Figure 13). As the bail wire swings upward it closes the blade contacts of one of the starting switches (See Figure 3). Both starting switches are connected in parallel and are connected across the phono junction box relay coil by means of the 4-wire cable between the junction box and the mechanism. When either starting switch closes the voltage applied to the relay will then be shorted out, and the relay falls out. The contacts of this relay are so arranged that the amplifier is turned on when the relay falls out. The turntable motor will be turned on by the amplifier after it has warmed sufficiently for normal operation. The action of the above relay can also be employed to change the decorative lighting scheme of the phonograph when selections are made. Full details will be found in the "Phonograph Junction Box" section in the manual referred to above. When the relay coil is shorted out, full voltage is applied to the carriage gear motor.

The carriage motor moves the carriage by means of a drive arm which is coupled to the carriage drive chain. The chain runs on a drive sprocket which is mounted on the motor shaft and an idler sprocket mounted on the main base. The carriage slides along on the guide rods until the trip lever of one of the carriage switches strikes the raised end of a tripped selector finger (See Figure 6). This actuates the switch, closing the circuit to the selection relay. This relay then picks up, closing a pair of its contacts designated as SR1 (See Figure 1). The closing of these contacts allows current to flow through the transfer gear motor. The SR1 contacts also short-circuit the armature of the carriage motor producing a dynamic braking action which quickly stops the motor with the carriage positioned so that the record-gripping shoes are directly in line with the selected record.

The transfer motor turns a spur gear which is meshed with the driving gear on the motor shaft. The driven

gear rotates the cam, shaft and gear assembly, which includes the tone arm cam and the transfer gear.

The transfer gear performs two functions. First, it turns the record release cam gear, allowing the inner shoe and the gripper shoe fastened to the end of the transfer arm to move toward each other, thus gripping a record. Secondly, it causes the record to be lifted from the record rack and placed upon the turntable.

As the record moves toward the turntable, a slot in the transfer (mushroom) cam engages the toggle pin assembly. This action turns the record to a horizontal position before it is placed on the turntable. The side of the record that is turned up is determined by the toggle pin that engages the transfer cam. The position of the toggle pin assembly is shifted by contact with the toggle shifter brackets mounted on the main base near either end of the record rack as the carriage reaches the end of its travel in either direction.

After the record reaches the turntable, the record release cam turns to force the inner shoe and the transfer arm and gripper shoe assembly apart, thus compressing the cam spring and releasing the record from the shoes. Further rotation of the cam shaft lifts the tone arm, swings it over the record, and then lowers it to the record surface. At this time, the cam shaft switch contact pair CS1 closes (See Figure 12). In closing, contacts CS1 short out the selection relay. This allows the current through the proper reset solenoid to increase, drawing the solenoid plunger upward. The plunger moves a reset lever so as to restore the tripped selector finger and release the carriage switch trip lever. The trip lever swings back to its normal position, allowing the carriage switch contacts to open, which stops the flow of current through the reset solenoid. As the selection relay is shorted out, it falls out, opening contact pair SR1 and closing contact pair SR2. Contacts SR2 complete a short circuit around the transfer motor armature and the motor quickly stops due to the dynamic braking action mentioned previously. If only one selector finger was tripped, the bail which operated the starting switch falls as the selector finger is restored, opening the starting switch contacts. If more than one selection has been made and additional fingers have been tripped, the starting switch remains closed, but the carriage motor will not start until the cam shaft switch has been reset as the record is returned to the record rack.

After the record has played, the tone arm stylus moves

into the cutoff groove. At this point a lever on the tone arm pivot assembly actuates the cutoff (reversing) switch. The reversing control relay in the carriage junction box will then become energized through the cutoff switch contacts. As the relay picks up, contact pair RR2 opens and contact pair RR1 closes (See Figure 1), reversing the flow of current through the transfer motor. As the transfer motor runs, the tone arm cam will rotate, raising the tone arm and swinging it to clear the record. The record is then gripped by the inner and outer shoes, lifted from the turntable, deposited on the record rack, and released. The cam shaft switch lever arm continues to rotate until it moves the cam shaft switch blades back to their normal position (See Figure 12). At this point contacts CS2 shut off the flow of current through the reversing control relay, which then falls out. The transfer motor will stop quickly as its armature is short-circuited by reversing control relay contact pair RR2 which closes as the relay falls out.

If there are no remaining tripped selector fingers, the phono junction box relay will become energized, thus turning off the amplifier and turntable motor and changing the decorative lighting.

The record cancel pushbutton switch in the phonograph junction box parallels the cutoff switch. It is normally

used to cancel the record being played. If the supply current to the phonograph or the DC power to the mechanism is broken while a record is being returned to the record rack, movement of the transfer arm will stop as the reversing control relay falls out. The transfer arm will not resume its travel when power is restored. Press the cancel button and the relay will pick up and operation will continue.

The starting switches are paralleled by the carriage traverse pushbutton switch mounted in the top of the mechanism junction box. When the mechanism is not in operation, the carriage can be moved to facilitate record installation by pressing this switch.

The cycle of operation of the mechanism and the function of all its parts can be understood most clearly by following through the associated electrical cycle in the mechanism control circuit as presented in the diagrams and explanation on pages 14 through 17.

In order to register the total selections played by the mechanism, a mechanical counter is installed on the playmeter actuator bracket. The number of times an individual record is played is recorded on the playmeter located at the front of the mechanism. An annunciator which indicates the number of a particular record being played is mounted on the same brackets which support the counter wheels.

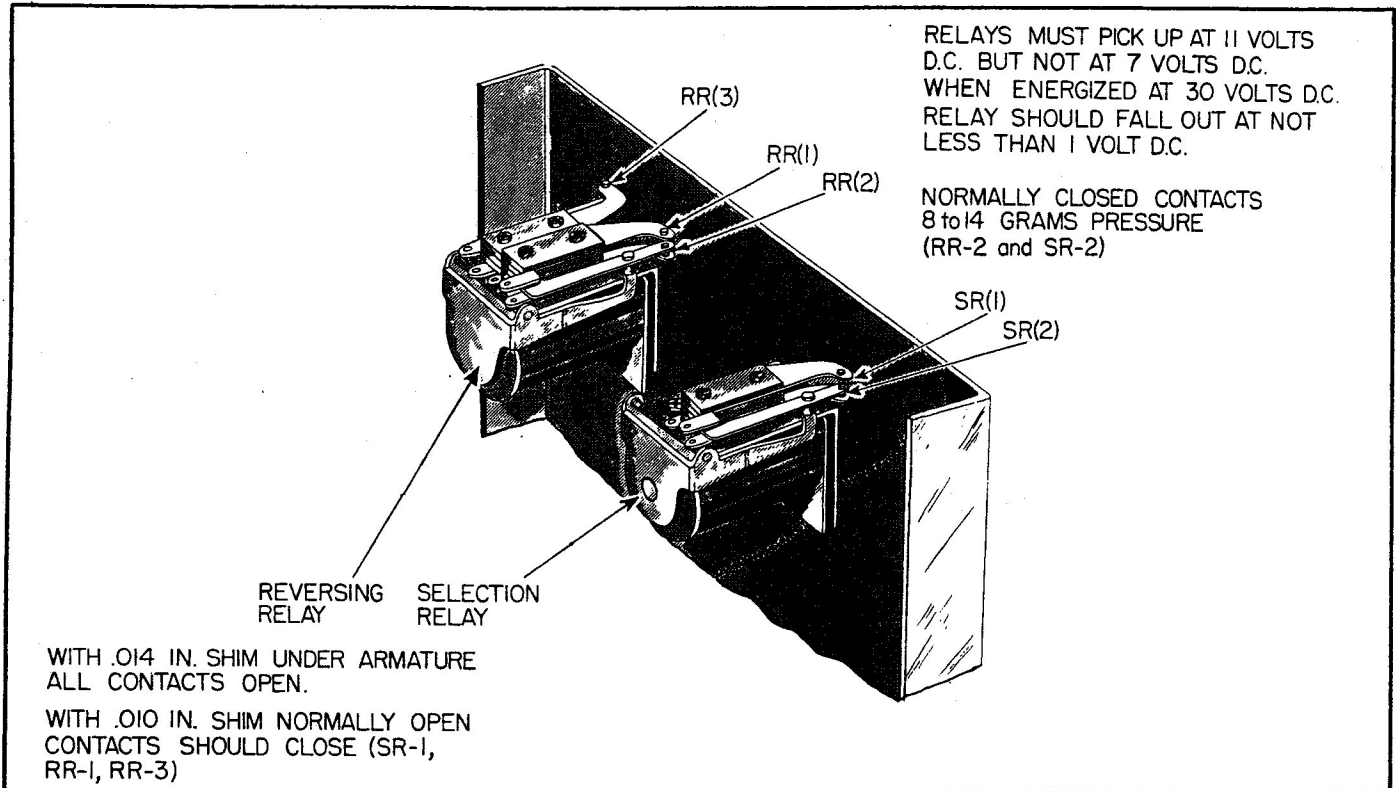


FIG. 1. - CONTACT IDENTIFICATION AND ADJUSTMENTS - CARRIAGE JUNCTION BOX RELAYS

MECHANISM ADJUSTMENT DATA

WHILE SERVICING THE MECHANISM, THE D.C. SWITCH ON THE MECHANISM JUNCTION BOX MAY BE TURNED OFF SO THAT THE MECHANISM WILL BE INOPERATIVE. THIS WILL NOT, HOWEVER, PREVENT SELECTIONS FROM BEING REGISTERED IN THE SELECTOR BANKS.

The following section is devoted to the proper procedures for complete adjustment of the Mechanism Assembly. The adjustments are all relatively simple. Proper care and adjustment of your AMI mechanism will insure consistent, trouble-free operation.

Turntable Disc

If the decorative metal disc on the turntable cannot be readily lifted off, run the carriage to the left-hand limit of its travel. Then, by reaching beneath the turntable with the left forefinger, the disc can be pushed upward through one of the two holes in the turntable.

Mechanism Cover

The cover which encloses the turntable motor can be readily removed for access to those components which are mounted on the carriage base. It is not necessary to remove the right and left side covers from the tab cover to accomplish this. The recommended procedure for removing the complete cover is as follows:

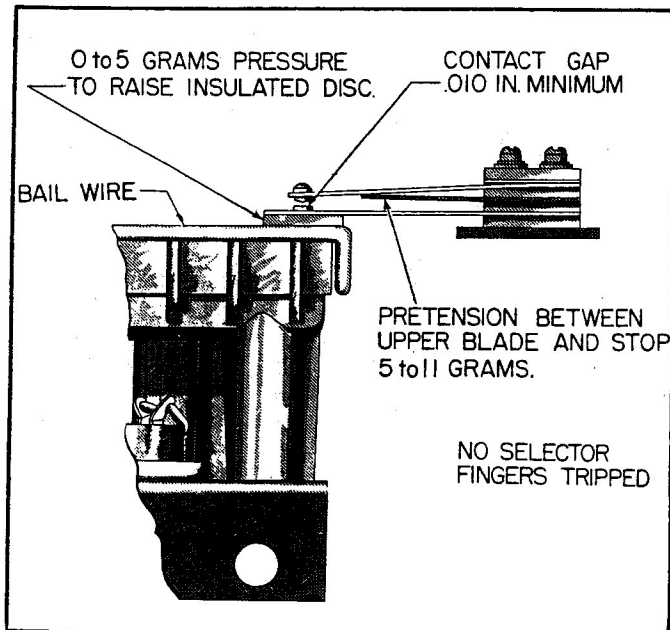


FIG. 2. - STARTING SWITCH ADJUSTMENTS - OPEN

When facing the front of the mechanism, run the carriage to the extreme right-hand limit of its travel and, after removing the turntable, remove the three screws in the top surface of the cover. Then, while lifting the end of the tone arm up out of the way, raise the left side of the cover until it clears the annunciator channel. The entire cover assembly can then be lifted upward and forward until clear of the mechanism. Replacing the cover is accomplished through following this procedure in reverse.

Carriage and Guide Rods

The carriage uses three-point suspension on the guide rods. The guide rod nearest the record rack is fixed in its position and supports two of the three carriage bearings. The shorter guide rod at the front directly beneath the playmeter is self-adjusting due to the slotted holes in the rod support brackets. The carriage should move smoothly without undue binding between the bearings and guide rods. The felt wicks provide a reservoir for oil to insure proper lubrication of the rods.

Turntable Height

The turntable should be level and in proper relationship to the inner and outer gripping shoes. This can be checked with the transfer arm in playing position. The uppermost surface of the turntable flocking should be

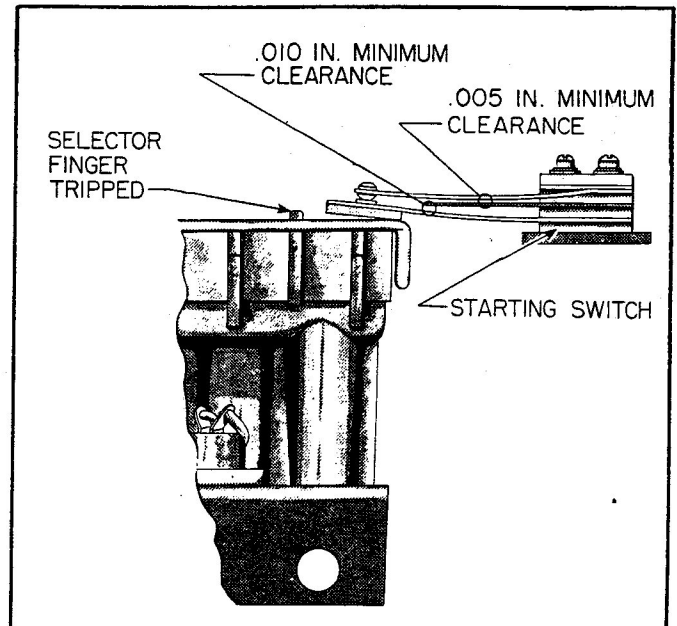


FIG. 3. - STARTING SWITCH ADJUSTMENTS - CLOSED

higher than the bottom edge of the V-shaped gripping faces of the inner shoe by $1/16$ to $7/64$ inch, and higher than the bottom edge of the gripping face of the outer shoe by $1/16$ to $3/32$ inch. The relationship between the turntable and the gripping shoes must be true in either condition of toggle (transfer arm either to the right or left of the turntable) and with all parts in the least favorable position. Records will then be released by the gripper shoes before coming into contact with the flocked surface. The posts which support the turntable mounting plate can be adjusted for proper height after loosening the locking nuts (See Figure 4). The position of the transfer arm outer shoe support can be adjusted by bending the support up or down, being careful not to distort the turntable plate.

Turntable Centering

Allow the transfer assembly to lift a record $6-13/16$ in diameter from the record rack and begin to place it on the turntable. Turn off the D.C. switch at this point and continue the action by rotating the transfer motor armature by hand. As the record descends onto the turntable, note whether the center of the record hole is aligned with the center of the turntable (at the right and left side of the spindle) within $1/64$ inch. Repeat this check with the toggle in the opposite position so that the record is played with the opposite side up. Turn on the D.C. switch and allow the mechanism to complete the action of placing the record on the turntable. Then by hand, turn the transfer motor armature back so as to begin the action of gripping the record. As the shoes approach the record, note whether all three shoes grip the record simultaneously within $1/32$ of an inch. If these observations indicate that the position of the turntable should be adjusted, it is first necessary to remove the turntable. This can be done by rotating the turntable until one of the thumb holes is directly over the top of the idler pulley. Then, after lifting the turntable slightly, insert the thumb through the hole while reaching under the turntable with the index finger. The drive belt can, by this means, be lifted off. (Be careful not to get the turntable shaft dirty before replacing it). Replace the turntable without replacing the drive belt. By rotating the turntable, the three screws holding the mounting plate to the support posts (See Figure 5) can be loosened by inserting a screwdriver through the thumb holes so that the turntable can be positioned according to the limits described above. When the final position has been established, tighten the screws, each a little bit at a time, until all are tight. The turntable drive belt can be replaced by a means similar to the method for taking it off.

Carriage Drive Chain

The chain is of the link and pin type and should be sufficiently loose so that free operation occurs when the motor is running. To measure the slack in the drive chain, the carriage should be stopped with the drive chain pin midway between the two chain sprocket centers. On the R-484 Mechanism this is accomplished by making selection No. 39. For the R-520 Mechanism make selection No. 59. With a straight-edge laid along the top of the chain between the tops of the sprockets, measure the distance from the bottom of the straight-edge to the center of the drive chain pin. If this distance is between $7/16$ inch and $9/16$ inch on the 80-selection mechanism or $9/16$ inch to $3/4$ inch on the 120-selection mechanism, the slack is correct and the tension is adjusted properly. If the tension is not correct, it is adjusted by moving the carriage motor position, first having run the carriage all the way to the left so that the connecting pin holding the drive arm is over the idler sprocket. After adjustment of the carriage drive motor position, check the chain slack by means of the procedure given above. Repeat the process, if necessary, until the tension is correct.

Transfer Drive

The transfer assembly is driven by a gear motor which is coupled to it by means of two gears. The smaller gear is fastened to the motor shaft by means of a set screw. The larger is fastened to the main driving shaft also by a set screw. The position of the large gear on the main driving shaft also controls the end play of this

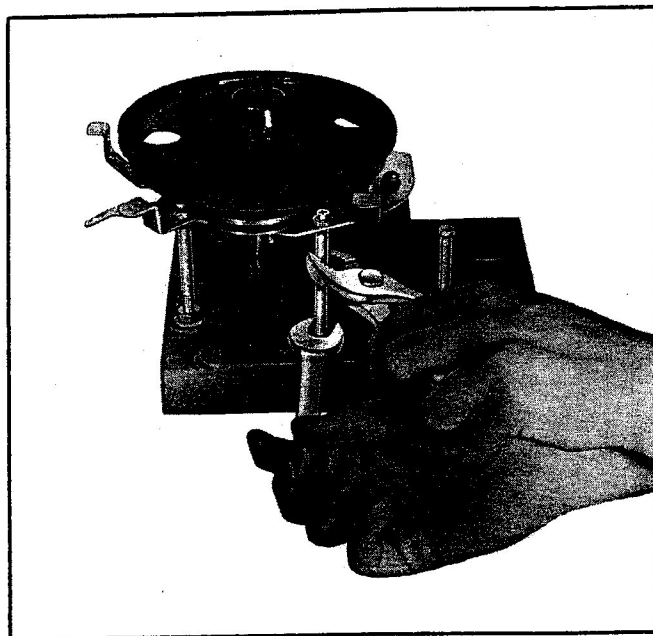


FIG. 4. - TURNTABLE HEIGHT ADJUSTMENT

shaft since the cam is fixed in its position on the other end of the shaft. The drive shaft end play must not exceed .005 inch. The meshing of the two gears is controlled by the position of the transfer gear motor, which is movable because of its slotted mounting holes. If the gears are meshed too tightly, it will cause binding and uneven speed of the transfer action as the gear motor operates. If they are meshed too loosely, there will be excessive backlash between these two gears. Backlash should be held to a minimum, keeping in mind that no binding should occur as the gears rotate. If the transfer arm is moved by hand when the gear motor is not running, the backlash between the driving and driven gears can be easily observed.

Carriage Junction Box

The position of both selector switch pawls should be such that the entire width of the tips of the pawls will engage a tripped selector finger in making a selection. The selector switch levers are held in position by means of a frame with three mounting screws (A in Figure 6). The two bottom screws go through the carriage box and into the main mounting bracket. The top screw goes through the carriage box from the back side and into the frame. To perform the pawl interference adjustment, run the carriage to the last selections to the right (facing the phonograph). Loosen the three screws holding the switch lever frame to the main box. Then loosen the two screws holding the main box in its vertical position. Push the main box all the way up and tighten the two screws in this position, first making sure that the distance from the lower edge at each side of the box to some reference level on the mechanism is approximately equal. The box will then be square with the main mechanism base. Then (with the mechanism turned off) trip the two opposite selector fingers under the pawls and, by moving the switch lever frame, set the height of the switch lever pawls so that the tips of the pawls either just touch the top edge of the two tripped selector fingers or, if there is still interference with the frame moved up as far as it will go, set the frame so that the interference at both pawl tips is equal.

Tighten the switch lever frame in this position using only the top screw. Now, one at a time, carefully loosen the two screws holding the main box in its vertical position and lower each corner of the box until the required pawl interference is obtained. Tighten all screws. Check the pawl interference at both ends and at the middle of each set of banks to make certain the adjustment is correct.

The carriage junction box controls the activity of the mechanism once a selector finger is tripped. For this

reason, it must be carefully positioned with respect to the carriage. The general procedure is to *first* adjust the carriage position by hand so that the gripper shoes are in the exact position for gripping a given record. This is accomplished by turning the armature of the carriage motor until the distances are equal from either edge of the V-shaped face of the upper inner shoe to the corresponding surface of the record. (The record must not be warped and it must be wedged exactly in the center of its space in the record rack). *Secondly*, the horizontal position of the carriage junction box is adjusted so that the switch levers are in the proper position relative to the selector fingers which correspond to this particular record. *Thirdly*, the fixed electrical contact in the selector switch stack is adjusted to stop the carriage in the position at which the first and second adjustments were made.

The position in which the carriage stops when making a selection is determined by the position of the corresponding fixed contact in the selector switch stack (See Figure 6). The horizontal position of the carriage junction box is adjusted (by means of the slotted holes in the bracket holding the box to the carriage casting) so that when the gripper shoes are in the exact position for gripping a record (as described above), the selector switch lever pivot rod is directly over the center line of the selector finger corresponding to this selection. For reference purposes, the distance from the center of this pivot rod to the inside back surface of the carriage junction box is 11/16 inch. Therefore, when the distance measured from this surface to the center of

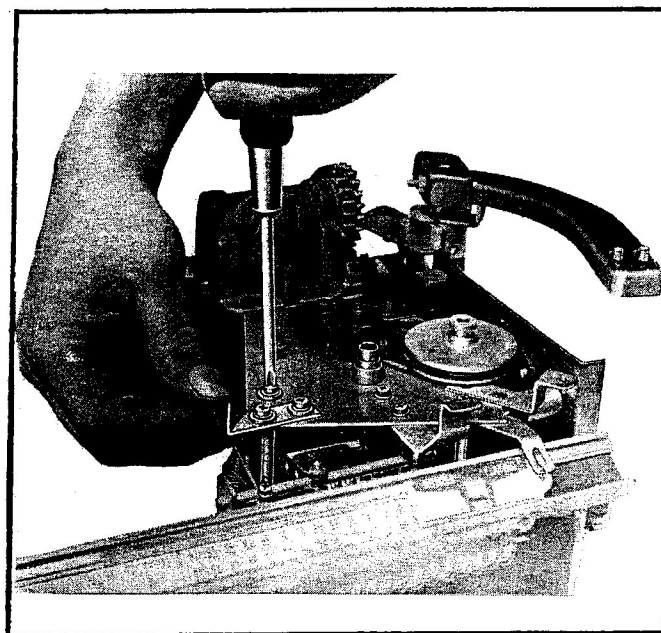


FIG. 5. - TURNTABLE CENTERING ADJUSTMENT

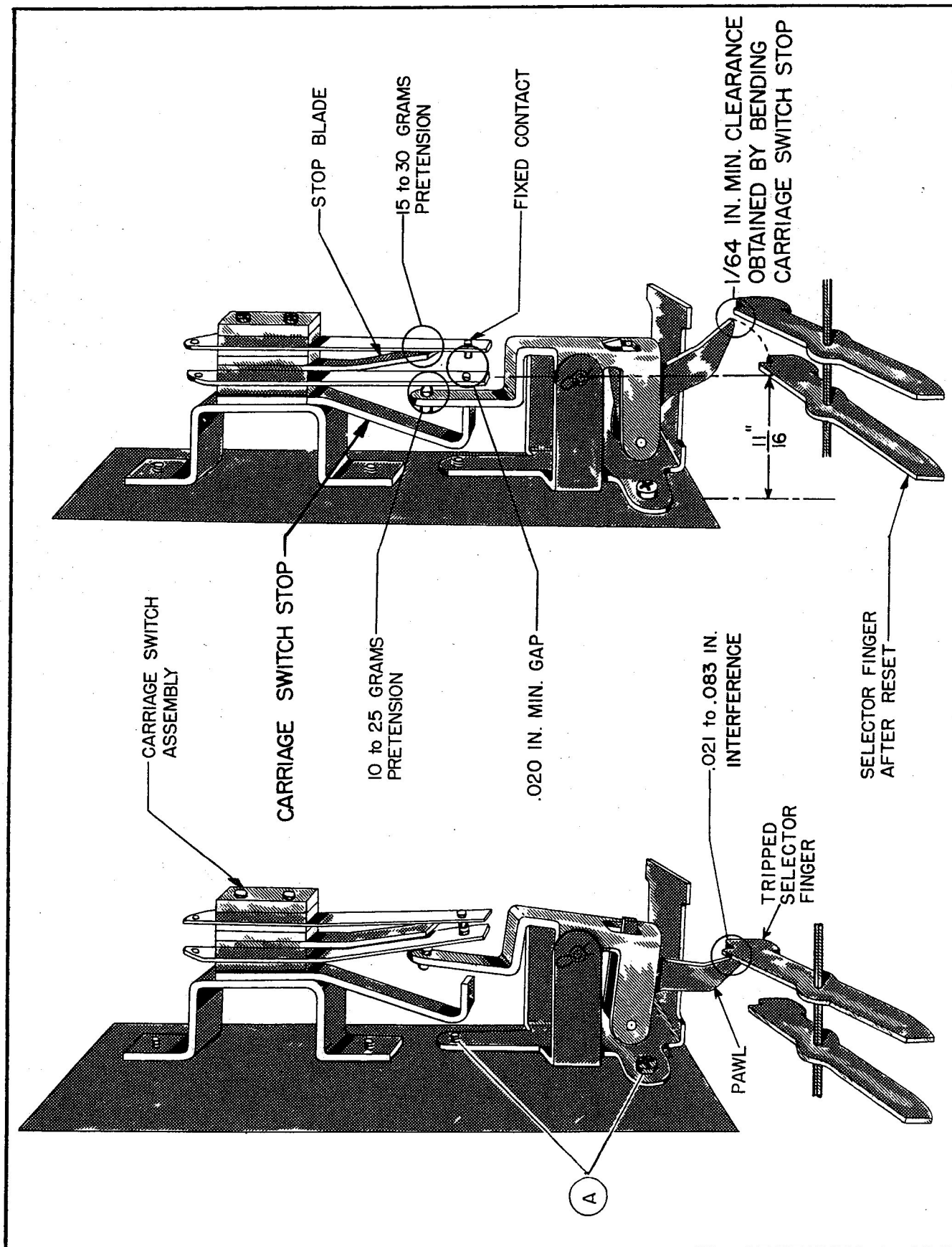


FIG. 6. - CARRIAGE SWITCH ADJUSTMENT

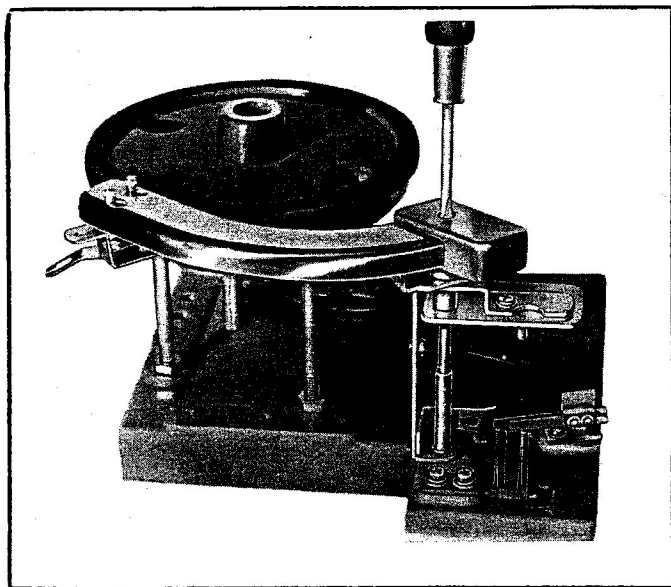


FIG. 7. - CAM PLATE CLEARANCE ADJUSTMENT

the selector finger corresponding to the record position is $11/16$ inch, the pivot rod is centered over the selector finger. This $11/16$ dimension is shown in Figure 6, where the selector finger beneath the pivot rod is shown in a restored or untripped, position. When this measurement is made, the side play in the selector finger must be taken up in the direction that the selector pawl pushed it during normal operation. This adjustment should be made with the carriage in the position corresponding to the record which has selections number 19 and 20 on it. Then it is the function of the fixed selector switch contact to cause the carriage to stop in this same relative position when the mechanism is

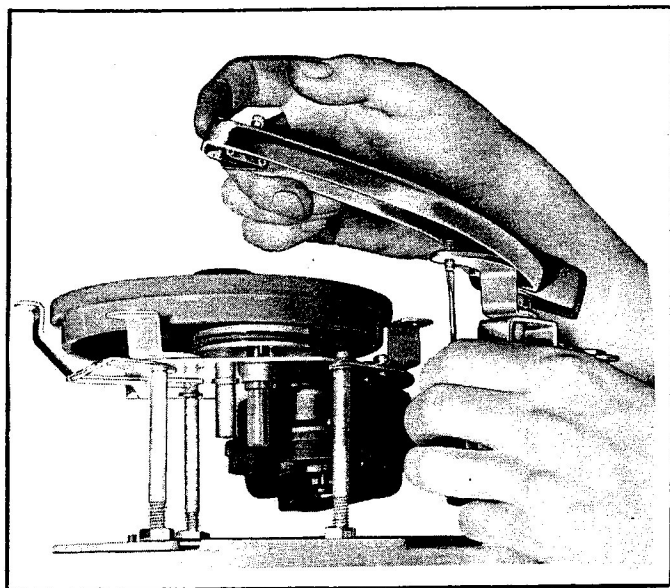


FIG. 9. - TONE ARM HEIGHT ADJUSTMENT

operated electrically. The position of the fixed electrical contact (one for each direction of travel) must be adjusted until the carriage stops automatically in the correct position. This is done by bending the stop blade shown in Figure 6. The correctness of this adjustment can be easily checked as follows:

When the $11/16$ inch relationship above is established, make a pencil mark on the annunciator channel at the point where the annunciator slide drive bracket is positioned. When the mechanism is operated electrically at normal line voltage (117 volts), the action of the carriage switches should stop the carriage with the slide drive bracket in alignment with the pencil mark. Repeat the adjustment if necessary until this is accomplished. With the carriage in this position, the record will be

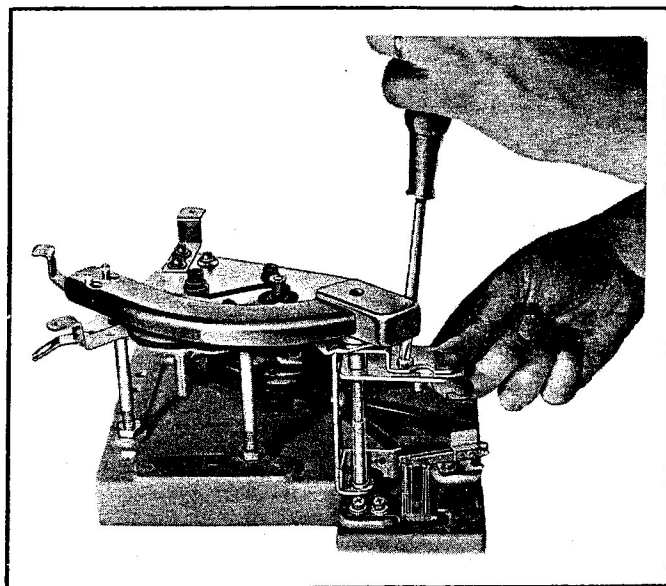


FIG. 8. - TONE ARM LEAD-IN ADJUSTMENT

moved from the turntable into the exact center of the slot in the record rack after either selection No. 19 or 20 has been played.

Tone Arm

The overall height of the tone arm assembly is controlled by the main pivot screw accessible through a hole in the counter balance directly over the pivot post (See Figure 7). The screw is adjusted to set the height of the cam plate assembly .020 inch higher than the point on the cam where the two flat surfaces intersect. This intersection is approximately at the middle of the flat area where the cross section is the thinnest. This adjustment must be performed with the transfer arm over the turntable in playing position. The clearance between the cam and cam plate can then be measured with a

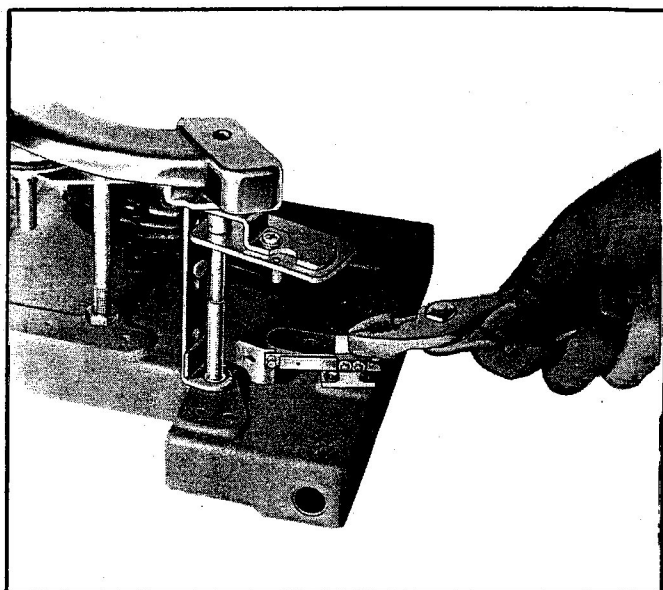


FIG. 10. - CUT-OFF SWITCH ADJUSTMENT

feeler gauge. If .015 inch to .025 inch clearance exists, the adjustment is satisfactory. If not, loosen the set screw at the side of the pivot bearing beneath the tone arm counterweight and turn the height adjusting screw as shown in Figure 7 until the proper clearance is obtained. Then tighten the set screw.

The tone arm moves vertically on two pivots, one of which is adjustable. This adjustment is made so that the vertical motion is perfectly free (action of moving up and down over the surface of a warped record) while restricting the lateral play in the tone arm to 1/32 inch *maximum* as measured at the point of the needle.

The point where the needle sets down on the record is adjusted by moving the cam plate with respect to the tone arm assembly. The screw which holds the cam plate to the assembly is loosened (See Figure 8) and the end of the tone arm can be moved toward or away from the center of the record as required.

The height of the needle is adjusted (by means of the brass set screw in the support bracket) so that the point of the needle is 1/8 inch above the inner turntable surface which is exposed by removing the turntable disc. Figure 9 illustrates this adjustment.

The small biasing spring on the tone arm pivot post is adjusted to bear against the flat rotating frame member at the time when the tone arm is setting down on the record. This spring exerts enough force in opposition to the tone arm action at this point to keep the needle from skating across the record. The spring position is adjusted by twisting it on the post by hand. The clamping bolt is tightened only enough to prevent the spring

from rotating on the post as it operates. The force exerted by the spring against the tone arm bracket, as measured at the end of the tone arm, should be 3 to 4 grams. The maximum deflection of the spring should occur when the needle has traveled from 1/16 inch to 3/16 inch beyond the point where it is set down on the record.

Cutoff (Reversing) Switch

The cutoff point is determined by the action of the cutoff switch. The exact point where the contacts close is adjusted by twisting the vertical end of the switch mounting bracket rather than adjusting the contact blades which are set to maintain a free contact gap of from .020 inch to .040 inch. Figure 10 shows how this adjustment is made.

Playmeter and Total Selection Counter

The actuator which operates the playmeter assembly uses a solenoid and plunger to rotate a main driving shaft through an actuating lever. Two other levers are also coupled to the driving shaft. One of these, the counter wheel drive lever, carries with it the counter lever which registers the count on the playmeter wheels. The amount of rotation that is imparted to the wheel is controlled by the actuator and is not adjustable. The position of the actuator is adjusted so that, before the counter operates, the toe of the counter lever is 1/16 inch from the tips of the teeth on the counter wheels and also so that when the carriage is in a position corresponding to a given selection, the center of the counter lever toe engages the proper counter wheel.

The force of the stroke is controlled by the position of the solenoid plunger and adjusted by clamping the actuator lever on the shaft at a position where the plunger is pushed into the solenoid as far as it will go when the counter lever toe is at the end of its stroke in registering a count on any counter wheel.

As the solenoid plunger moves, the drive shaft rotates causing the drive lever and counter lever to move toward the counter wheel until the counter lever toe reaches the bottom of the V between two adjacent teeth on the wheel. This position is shown at A in Figure 11. Further rotation of the shaft moves the drive lever still closer to the wheel, but the counter lever rotates on its pivot shaft at the end of the drive lever until it reaches the position shown by the dotted lines at B in Figure 11. At this point, the counter wheel has been rotated one tooth, thus registering one play.

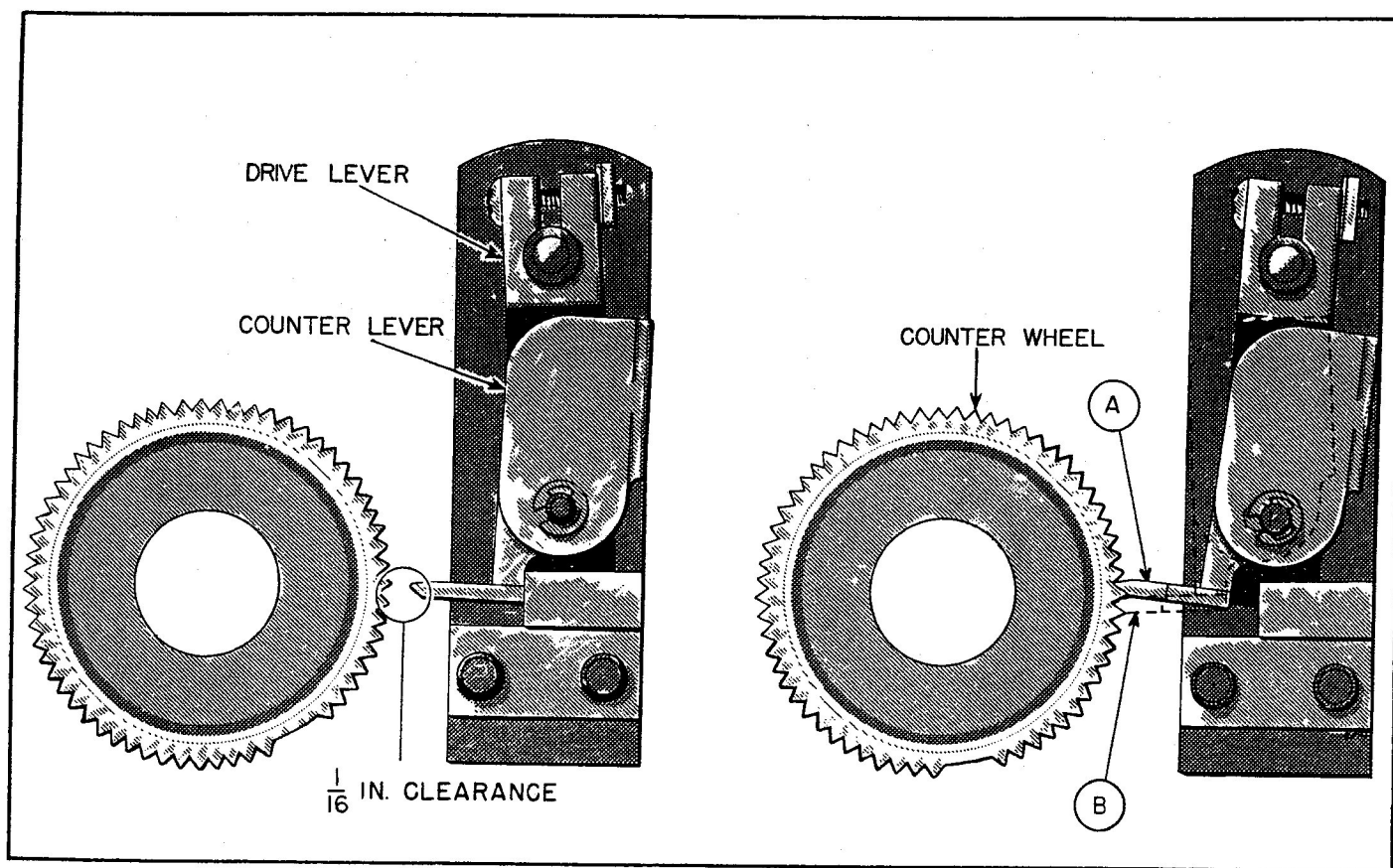


FIG. 11. – PLAYMETER ADJUSTMENT AND OPERATION

The remaining lever fastened to the drive shaft actuates a total play counter each time a record is taken from the record rack. The driving lever and the counter lever have a relative position such that when the carriage is in the position for selecting number 1 record (this record is chosen for convenience in adjustment), and the solenoid plunger is pressed down to the limit of its normal stroke, the total play counter lever will be pushed down only to the limit of its travel. Upon releasing the plunger, the two levers should not be touching each other, and the clearance between them should be from .001 inch to 1/32 inch.

The teeth of the counter wheels must be centered in the slots of the counter wheel stop strips. This is accomplished by moving the entire annunciator channel to the right or left after loosening the mounting bolts at each end. The stop strips are fastened to the channel and, due to slotted mounting holes, can be moved toward or away from the counter wheels. The tongues on any stop strip should not touch the numbered tape on the counter wheels but should engage the tabs on all wheels when the counter wheel assembly is reset to 0 by turning the counter reset knob.

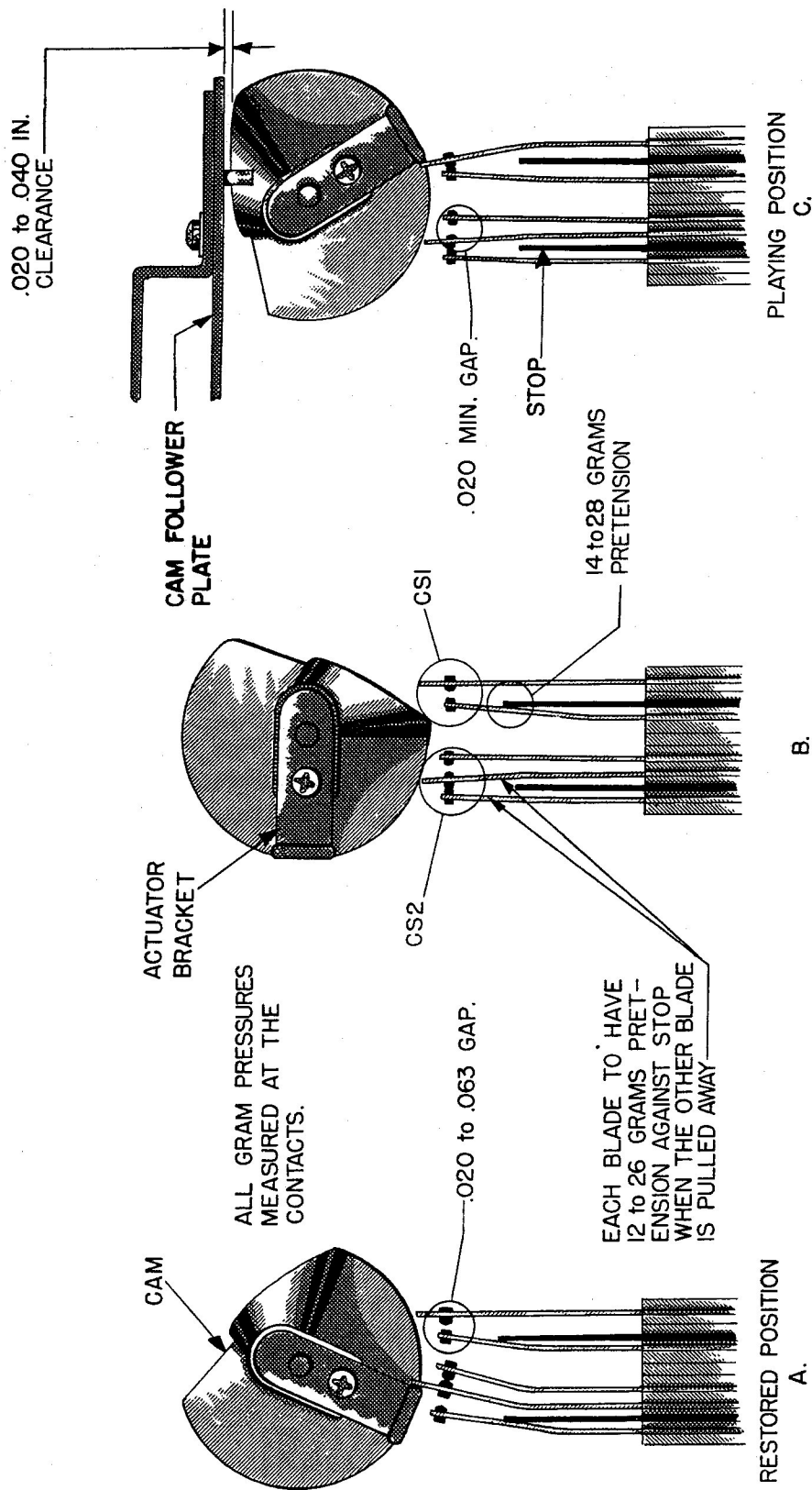
The annunciator number strips are held in position by

means of allen-head set screws along the top edge of the channel. The position of these strips should be such that the numbers are centered above the etched vertical lines on the stop strips.

The position of the annunciator drive bracket, which is held in place between the front turntable mounting stud and the turntable mounting plate, should be such that the number of the record selected is centered within the annunciator slide aperture on selections 59 and 60 on an 80-selection mechanism and selections 99 and 100 on a 120-selection unit. The drive bracket can be moved after loosening the screw in the top of the mounting stud. In some cases it may be necessary to move the number strips slightly in order to achieve optimum positioning of all numbers in the annunciator slide aperture. The drive bracket should clear the annunciator channel in all positions of the carriage.

A properly adjusted mechanism will handle records of varying diameters from 6-25/32 inches minimum to 7 inches maximum without jamming or otherwise failing to operate. This includes necessary clearance between records in the record racks and the gripping shoes as the carriage traverses in normal operation.

ALL CAMSHAFT SWITCH ADJUSTMENTS SHOULD BE MADE WHEN OPERATING MECHANISM AT A LINE VOLTAGE OF 115 VOLTS.

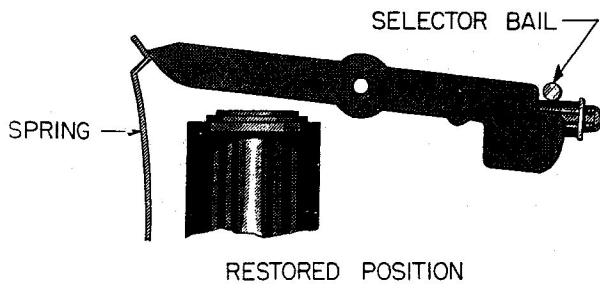


WHEN CS2 IS ACTUATED AS CAM TURNS TO RESTORED POSITION, THE LEFT-HAND CONTACTS MUST REMAIN CLOSED THROUGH 6 TO 14 ARMATURE BARS OF ROTATION OF THE TRANSFER MOTOR AFTER THE RIGHT-HAND CONTACTS CLOSE.

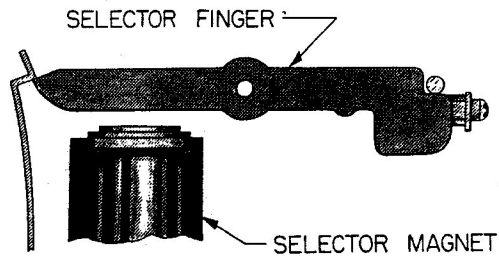
AFTER TRANSFER ACTION IS STOPPED BY CAMSHAFT SWITCH IN EITHER DIRECTION, THERE SHOULD BE A MINIMUM OF 2 TURNS OF THE TRANSFER MOTOR ARMATURE REMAINING BEFORE THE LIMIT STOP IN THE TRANSFER HOUSING IS ENGAGED.

THE .020 TO .040 CLEARANCE SHOWN IN FIGURE C, IS OBTAINED BY SHIFTING THE POSITION OF THE CAMSHAFT SWITCH MOUNTING BRACKET.

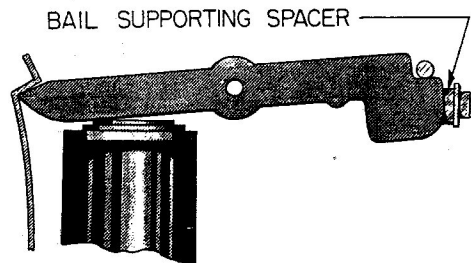
FIG. 12. - CAMSHAFT SWITCH ADJUSTMENT AND OPERATION



BAIL SUPPORTED ABOVE TOP FRONT SURFACE OF SELECTOR FINGER BY BAIL SUPPORTING SPACER AT CENTER OF SELECTOR BANK. SPACER MAY BE RAISED OR LOWERED SLIGHTLY BY LOOSENING SCREW.



SELECTOR FINGER STARTS TO TRIP AS MAGNET IS ENERGIZED. TOP SURFACE OF SELECTOR FINGER MUST **NOT** TOUCH SUPPORTED BAIL UNTIL REAR TIP OF FINGER IS **JUST BELOW** THE SHARP BEND AT TIP OF SPRING. AT THIS POINT FORCE OF SPRING ALONE WILL MOVE FINGER TO COMPLETE TRIPPED POSITION.



SELECTOR FINGER HELD IN TRIPPED POSITION BY SPRING. BAIL IS SUPPORTED ABOVE SPACER BY TOP FRONT SURFACE OF FINGER HEIGHT OF BAIL MUST BE SUFFICIENT TO ACTUATE BAIL SWITCH.

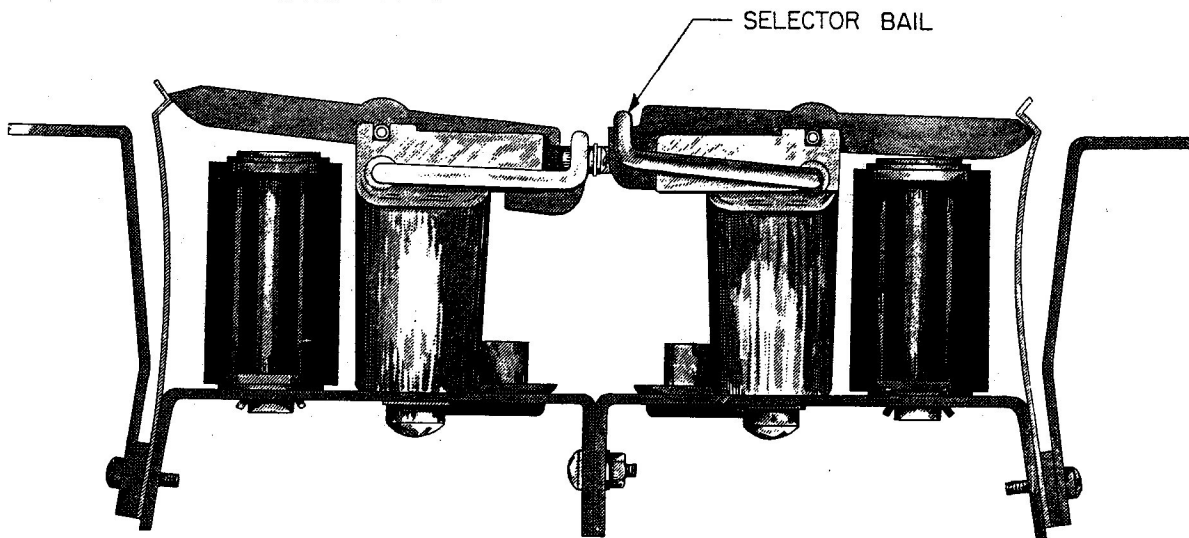
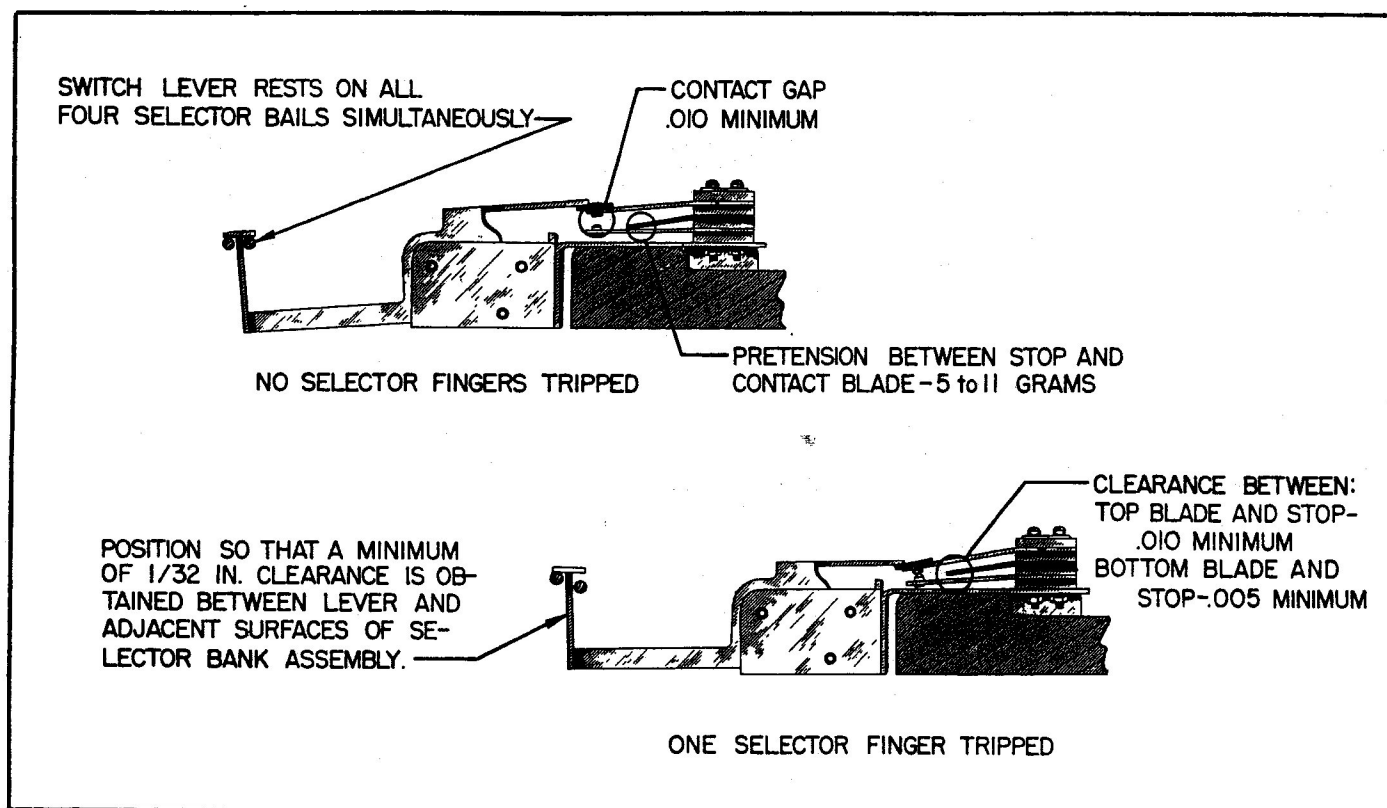


FIG. 13. - SELECTOR ASSEMBLY, ADJUSTMENT AND OPERATION



**FIG. 14. - TWIN BAIL SWITCH ADJUSTMENT
LUBRICATION**

Where practical in the Mechanism, the surfaces of parts operating where friction is present have been lubricated with Dow-Corning DC-44 fluid type silicone grease. This grease is a high-grade lubricant which resists flow and deterioration under heated conditions and will give your mechanism a high degree of protection with periodic inspection. DC-44 Silicone Grease is available from your AML Distributor.

Inspection of the following points should be made every two months and the surfaces re-lubricated where necessary *using only this grade and type of lubricant.*

Idler Sprocket

Toggle Pins

Toggle Camplate Bearing

All mating gear surfaces on the Transfer Assembly

The three slots in the *Mushroom* Cam

The two slots in the hub of the Gripper Bow

The engaging surfaces between the Transfer Cam and Tone Arm Cam Plate

The top end of the Tone Arm Pivot Shaft and also the area near the bottom where the brass guide on the Tone Arm Bracket moves up and down.

The two Tone Arm Cone Pivots

All the bearing surfaces within the transfer assembly

have been adequately lubricated with silicone grease. It should not be necessary to re-lubricate this assembly.

All other points of lubrication in the mechanism are lubricated with highgrade sewing machine oil. These points should be inspected every month and oiled when necessary.

Guide Rod Bearing Wicks (3). These felt wicks should be thoroughly saturated with oil.

Counter Actuator. When necessary put one drop of oil at the bearing point between the rod and the bracket at each end, one drop at the bearing point between the solenoid plunger and the pin holding the drive lever, and one drop at each bearing point where the counter lever pivots on the drive lever.

Carriage Junction Box. When necessary, put one drop of oil on the reset lever pivots.

Turntable Bearings. The turntable and idler shafts are drilled and felt wicks, saturated with oil, are inserted into the drilled holes. The oil content should be checked every two months by visual inspection. If the top of the felt is dry, drop in one drop of oil. If the oil is readily absorbed, put in another drop. As the wick becomes more nearly saturated, the drop of oil will be less readily absorbed. Do not put in more

oil than will be absorbed by the wicks. The wick in the turntable may readily be seen by looking down into the turntable hub. The wick in the idler pulley can be seen by rotating the turntable so

that one of the two thumb holes is directly over the top of the idler pulley.

WARNING! DO NOT OIL ANY PART OF THE SELECTOR ASSEMBLY!

GENERAL SERVICE INFORMATION

50-cycle Operation. In order to operate your phonograph from a source of 50-cycle current, it is necessary only to modify the turntable motor so as to obtain the proper turntable speed. Normally the motor assembly is supplied with two rubber drive belts slightly different in size and a motor shaft pulley designed for 60-cycle operation. This pulley must be replaced with a slightly larger one (part number F-1915) and the shorter drive belt replaced with the longer one (part number F-2143) in order to accommodate the larger pulley diameter.

Sometimes, during testing of the mechanism and when manual operation is being performed, the transfer motor may be inadvertently run far enough so that the transfer assembly engages its internal stop. Should this happen, it is not always apparent what causes the transfer motor to be inoperative. A slight push by hand on the transfer motor armature will relieve the binding and the motor will run normally.

It is possible to actuate the various phases of the transfer action by pushing the armatures of the relays in the carriage junction box. When the armature of the reversing relay is pushed in, the relay will hold in through its own contacts. This will produce the same effect as pressing the cancel button or tripping the cutoff switch, and a record on the turntable will be moved back to the record rack. If it is desired that movement of the transfer arm be stopped before the record is actually in the rack, push the armature of the selection relay and the transfer arm will stop. As soon as the selection relay armature is released, the transfer arm will resume its travel toward the record rack.

If it should be necessary to replace any of the cables in the wiring harness which runs from the carriage base to the main mechanism base, use *only* extra-flexible, rubber covered, two conductor parallel cord.

The vinyl plastic spacers along the top of the record racks require a special cement to fasten them securely to the metal separators. Adhesives of the Household Cement variety will not prove satisfactory. For this application B. F. Goodrich # A-458-B Adhesive is recommended.

If the contacts of the carriage junction box relays become dirty, the cause of the resulting abnormal

operation is not always apparent. The following paragraphs describe three different conditions which can be attributed to dirty contacts.

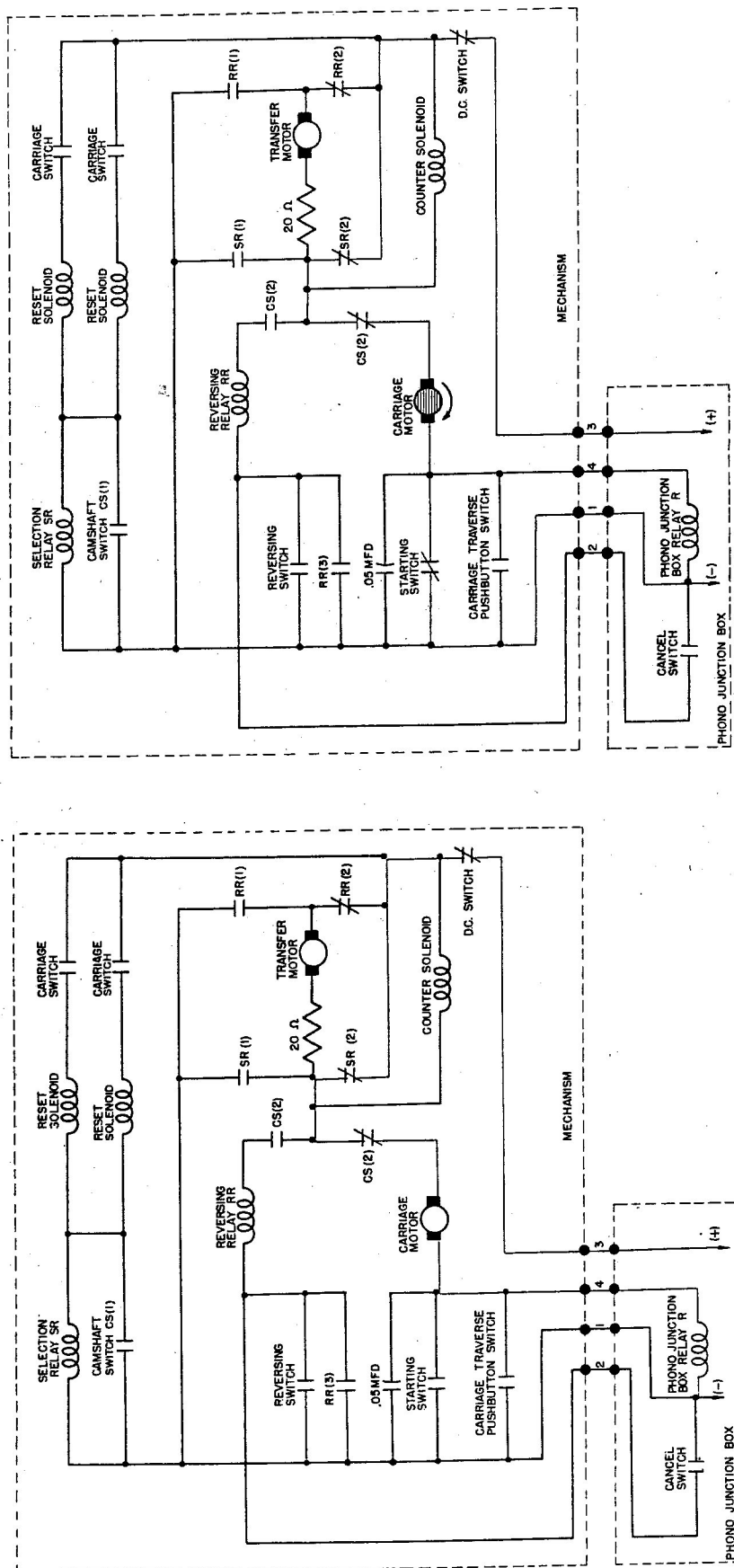
When a selector finger is tripped, the carriage will move a short distance and stop. No further action will occur until the cancel button is pressed, whereupon the carriage will again move the same amount and stop. This action can be repeated until the selector pawl contacts the tripped selector finger. The record will then be played normally. After the record has been restored to the rack, the same condition exists. This malfunction is caused by selection relay contacts SR2, which may need cleaning. Figure 1 shows the location of these contacts. Relay contacts can be cleaned by sliding a piece of paper between them or by the use of contact cleaner.

After a finger is tripped, the carriage moves to the proper point but the transfer assembly fails to move or moves only a short distance in transporting the record to the turntable. First, see if the selection relay is energized. If so, examine selection relay contacts SR2 and reversing relay contacts RR2. Either one or both of these contact pairs may need cleaning. Refer to Figure 1 for contact location. If the relay contacts are apparently touching, it can quickly be determined whether they are making good contact by shorting across the corresponding solder lugs with a screwdriver or other metallic object. If proper mechanism operation resumes during such a test, the faulty contacts have been located.

A record is selected, placed on the turntable, and played. After the record has played, the transfer assembly will not move the record back to the rack, even when the cancel button is pressed. This indicates that reversing relay contacts RR2 are not making contact properly, and should be cleaned.

A record is selected, placed on the turntable, and played. After the record has played, the transfer assembly starts to move the record back to the rack, but stops before appreciable transfer arm travel takes place. Pressing the cancel button will cause the transfer arm to resume its travel, but it may stop again before the record is deposited in the rack. At this point, if the reversing relay armature is pushed, it will not stay held in. This is due to the failure of reversing relay contacts RR3 to complete the circuit which will keep the relay energized while a record is being returned to the record rack.

MECHANISM CYCLE OF OPERATION



No. 1. POWER ON

DC switch on. All circuit elements in normal condition. All records resting in record rack. Phono junction box relay R is energized by current flowing through carriage motor armature. Relay resistance is high compared with motor armature resistance, and current flow through relay is too small to operate motor.

Current flow indicated by red lines.

Numbers 1, 2, 3, and 4 designate 4-wire cable from phono junction box.

No. 2. SELECTION MADE

When selection is made, the proper selector finger is tripped, lifting the bail wire and closing the corresponding starting switch contacts. These contacts short out phono junction box relay R, and full D.C. power is applied to carriage motor. Relay R falls out, turning on amplifier. Carriage motor starts to run, moving carriage along on guide rods. When the amplifier is properly warmed up, a relay mounted inside the amplifier chassis turns on the turntable motor.

Current flow indicated by red lines.

The schematic diagram illustrates the electrical control system for a tape deck, divided into two main sections: the **MECHANISM** and the **PHONO JUNCTION BOX**.

MECHANISM Section:

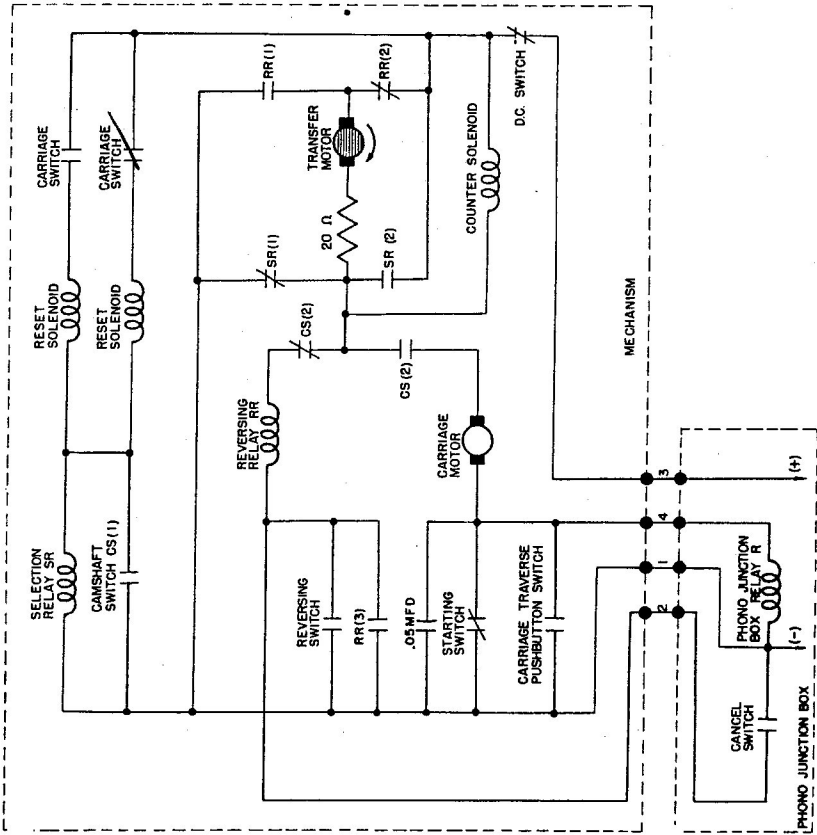
- Power Input:** A **D.C. SWITCH** provides power to the system.
- Reset Solenoid:** A **RESET SOLENOID** is controlled by a **CARRIAGE SWITCH** and a **CARRIAGE SWITCH** (normally closed).
- Transfer Motor:** A **TRANSFER MOTOR** is controlled by a **20 Ω** resistor and a **SR (2)** switch. It is also connected to a **SR (1)** switch and a **RR (1)** switch.
- Counter Solenoid:** A **COUNTER SOLENOID** is connected to the **TRANSFER MOTOR** circuit.
- Reversing Solenoid:** A **REVERSING SOLENOID** is controlled by a **CS (2)** switch and a **CS (1)** switch.
- Carriage Motor:** A **CARRIAGE MOTOR** is connected to the **REVERSING SOLENOID** circuit.

PHONO JUNCTION BOX Section:

- Selection Relay SR:** A **SELECTION RELAY SR** is connected to the **REVERSING SOLENOID** circuit.
- Camshaft Switch CS (1):** A **CAMSHAFT SWITCH CS (1)** is connected to the **REVERSING SOLENOID** circuit.
- Reversing Switch:** A **REVERSING SWITCH** is connected to the **REVERSING SOLENOID** circuit.
- Starting Switch:** A **STARTING SWITCH** is connected to the **REVERSING SOLENOID** circuit.
- Carriage Traverse Pushbutton Switch:** A **CARRIAGE TRAVERSE PUSHBUTTON SWITCH** is connected to the **REVERSING SOLENOID** circuit.
- Phono Junction Box Relay R:** A **PHONO JUNCTION BOX RELAY R** is connected to the **REVERSING SOLENOID** circuit.
- Cancel Switch:** A **CANCEL SWITCH** is connected to the **REVERSING SOLENOID** circuit.

The diagram shows the interconnections between these components, including the use of switches, solenoids, and motors, and the presence of a **20 Ω** resistor and a **.05 MFD** capacitor.

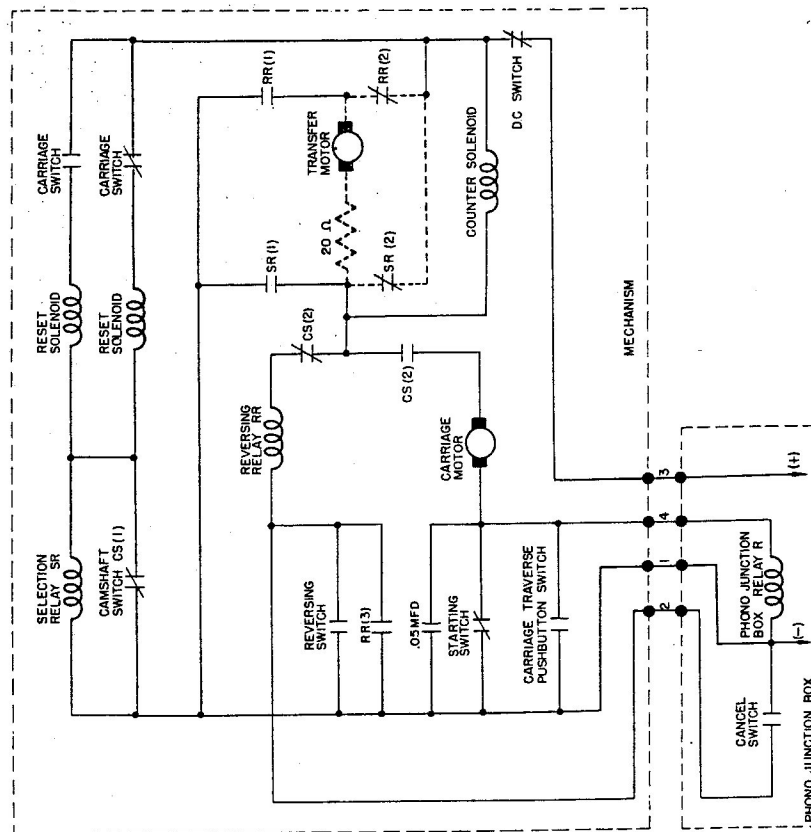
As carriage moves one of two carriage switch trip levers strikes raised end of tripped selector finger. Trip lever is depressed, closing corresponding carriage switch contacts and completing circuit through corresponding reset solenoid and selection relay SR. Resistance of relay SR is high compared to reset solenoid and limits current to a small value so that reset solenoid does not operate. Selection relay picks up closing contact pair SR1 and opening contact pair SR2. Armature of carriage motor is shorted through contacts CS2, SR1, and the starting switch. Circulating currents flow in this shorted path due to the coasting of the motor. These currents produce dynamic braking action which quickly stops rotation of motor armature. Circulating currents in shorted armature path indicated by dashed red lines. Carriage stops with gripper shoes of transfer assembly in line with selected record. Record counter solenoid is energized, registering one play on proper counter wheel and on total selection counter. Transfer motor operates transfer assembly which grips record, lifts it from record rack, and moves it toward turntable. Maximum torque of motor is limited by 20 ohm resistor so as to prevent damage to transfer assembly while adjusting mechanism.



As transfer assembly grips record, rotation of cam, shaft and gear assembly allows normally closed pair of camshaft switch contacts CS2 to open, and the normally open contact pair of CS2 to close. Armature circuit of carriage motor is now open and motor cannot move carriage until record has been restored to record rack, thus preventing accidental record breakage while changing records. Transfer assembly continues to move record toward turntable.

15

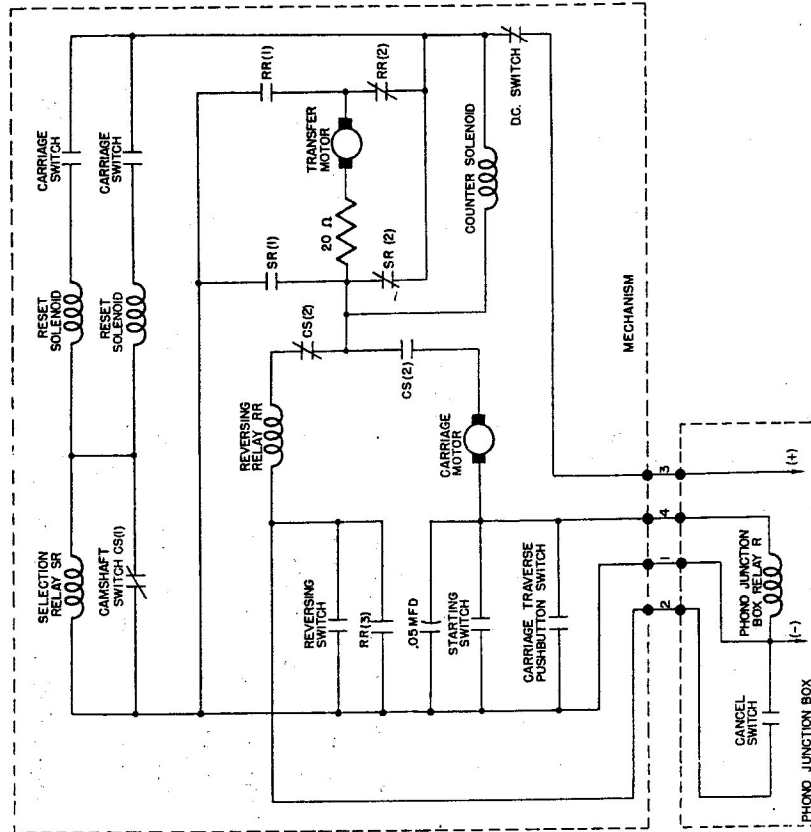
MECHANISM CYCLE OF OPERATION (Continued)



No. 5. SELECTOR FINGER RESET

Rotation of camshaft after record is placed on turntable and released operates camshaft switch again, closing contact pair CS(1), and selection relay is shorted out. Relay falls out, opening contact pair SR1 and closing contact pair SR2. Transfer motor armature is shorted and motor quickly stops due to dynamic braking action. Path of current in shorted armature circuit indicated by heavy dashed lines. Record counter solenoid is shorted out. Plunger returns to normal position, allowing counter actuating mechanisms to reset. Full D.C. power is applied to reset solenoid through contact pair CS1, energizing solenoid. Solenoid plunger moves, restoring the tripped selector finger to its normal position.

Current flow indicated by red lines.

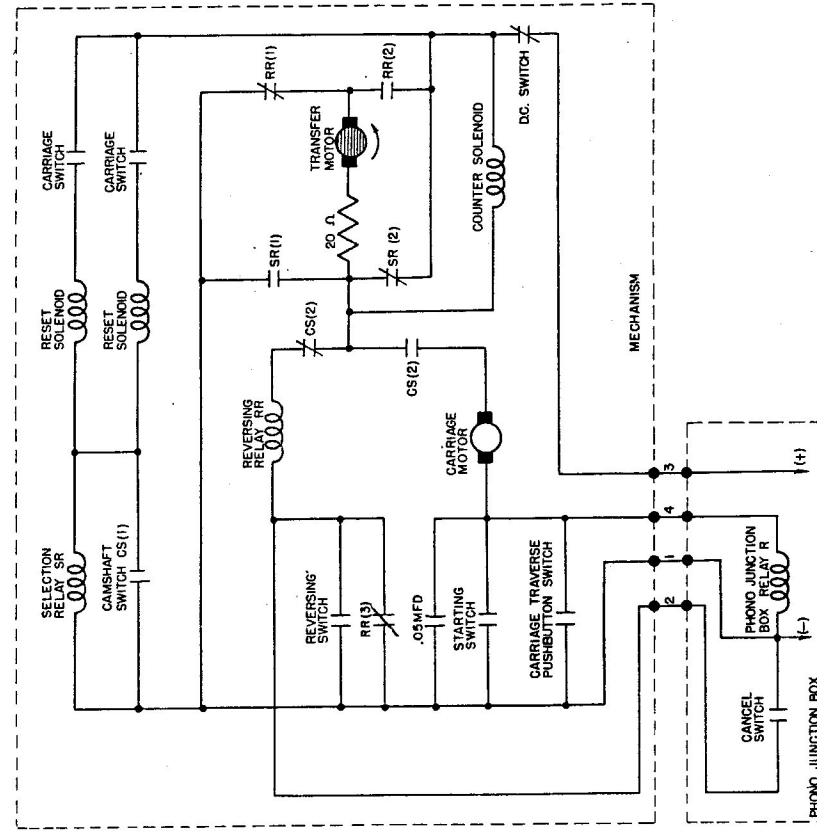


No. 6. RECORD PLAYS

As selector finger is restored, carriage switch trip lever is released. Trip lever resets, opening carriage switch contact pair. If only one selection has been made, bail falls, allowing starting switch contacts to open. Bail will remain raised, holding starting switch contacts closed if additional selector fingers have been tripped. Tone arm has been lowered onto record and selection is being played. Note that the action described in Figures 5 and 6 occurs almost instantaneously. Circuit conditions prior to and subsequent to the operation of the reset solenoid are shown in two diagrams in order to more clearly illustrate the sequence of operation.

No current flowing in circuit.

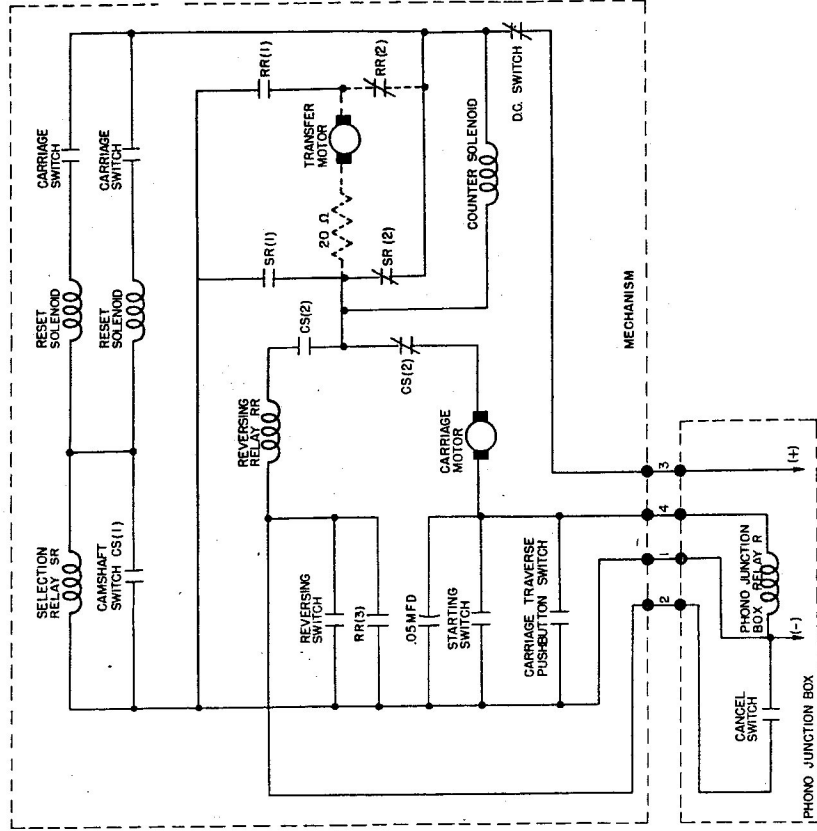
MECHANISM CYCLE OF OPERATION (Continued)



No. 7. RECORD PLAY COMPLETED

After record playing is completed, tone arm rides into cut-off grooves in center of record. Movement of tone arm closes reversing switch contacts, completing circuit through reversing relay RR. Relay picks up, closing contact pairs RR1 and RR3 and opening contact pair RR2. Current flows through transfer motor in the opposite direction (from direction indicated in Figures 3 and 4) and motor starts to operate transfer assembly so as to grip record and lift it upward from turntable. Rotation of camshaft allows contact pair CS1 of camshaft switch to open. Tone arm swings clear of turntable, opening reversing switch contacts. Current through reversing relay is maintained by contact pair RR3. Transfer assembly continues to move record toward record rack.

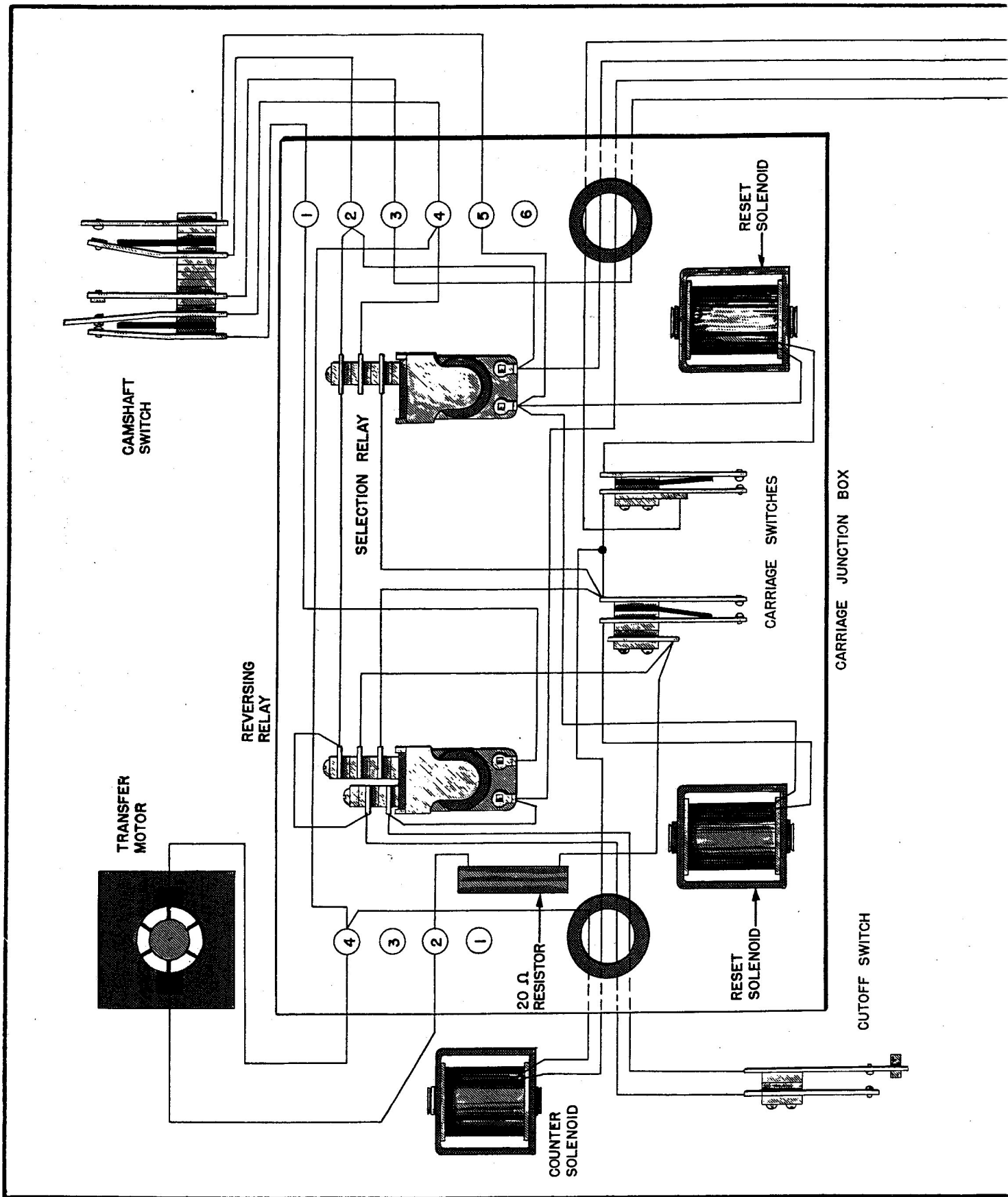
Current flow indicated by red lines.



No. 8. RECORD RESTORED TO RACK

Record is returned to record rack and released. Continued rotation of camshaft actuates camshaft switch so as to open the normally open contact pair and close the normally closed contact pair of CS2. Circuit through reversing relay is broken and relay falls out, opening contact pairs RR1 and RR3, and closing contact pair RR2. Transfer motor armature is shorted through contact pairs SR2 and RR2. Circulating currents in armature circuit cause motor to stop quickly due to dynamic braking action. Path of circulating currents indicated by heavy dashed lines. Phono junction box relay R becomes energized through carriage motor armature. When relay picks up its contact pairs turn amplifier off and turntable motor stops.

Mechanism has now been returned to normal condition as shown in Figure 1.



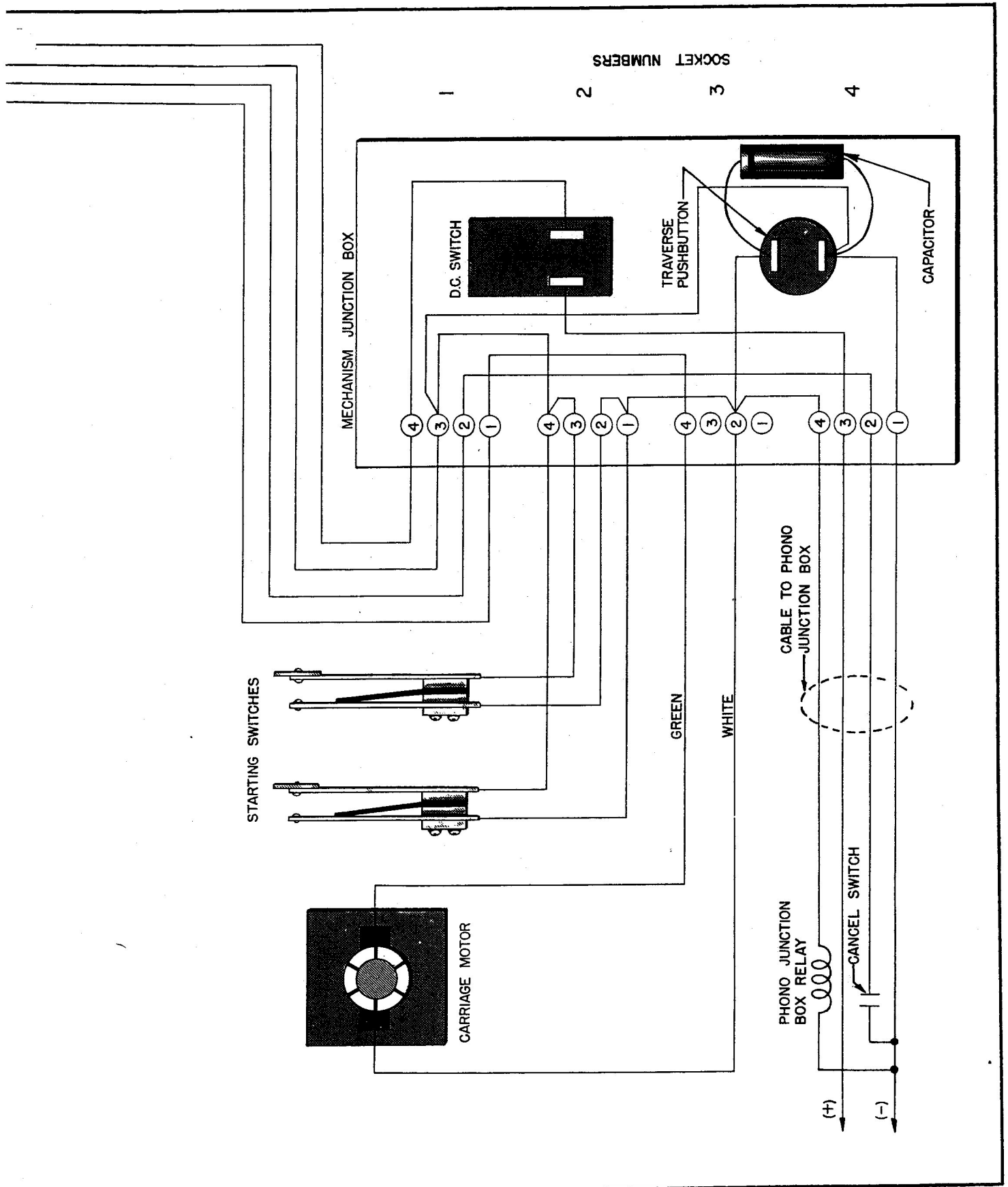


FIG. 15. — MECHANISM WIRING DIAGRAM

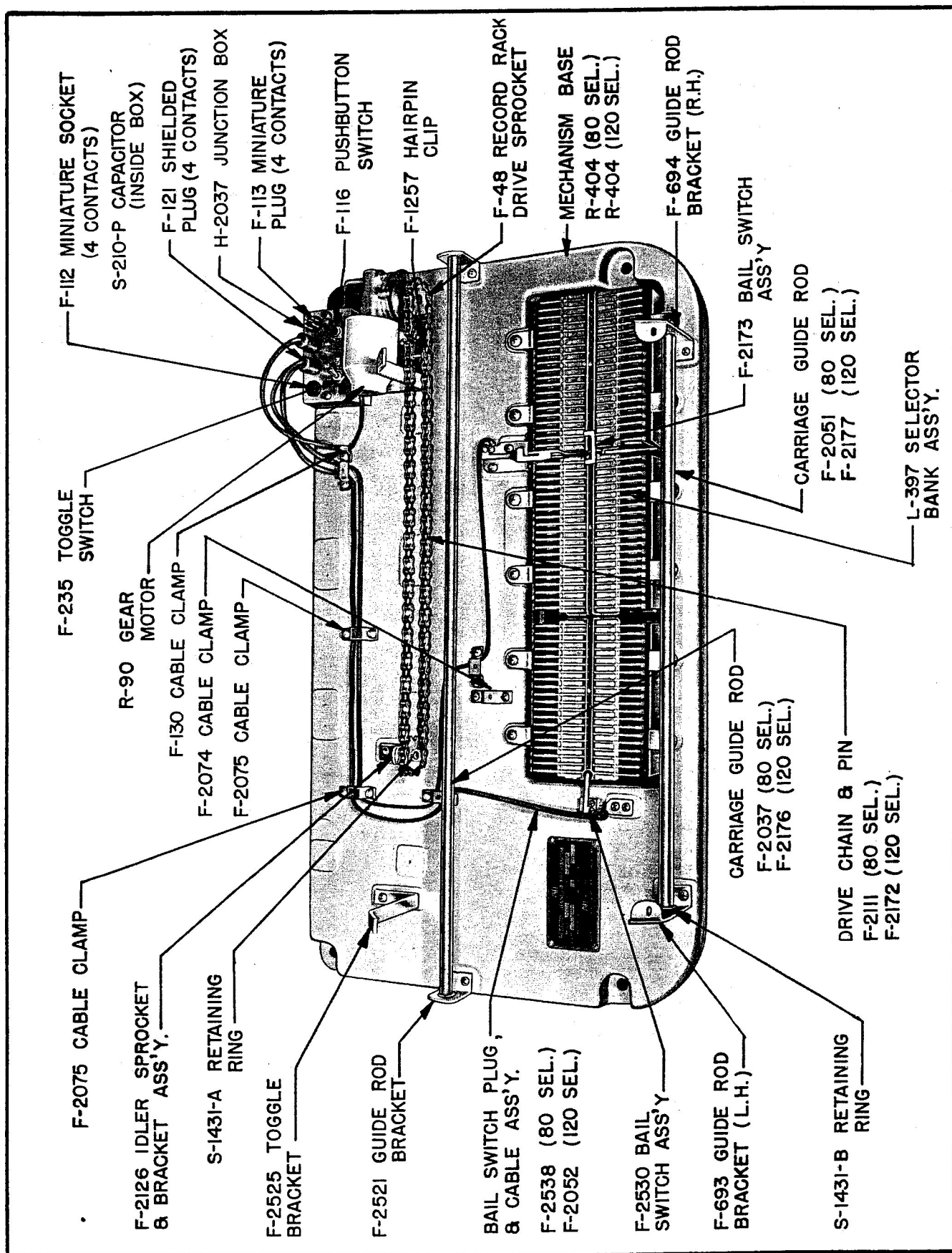


FIG. 16. - MECHANISM - CARRIAGE AND RECORD RACKS REMOVED

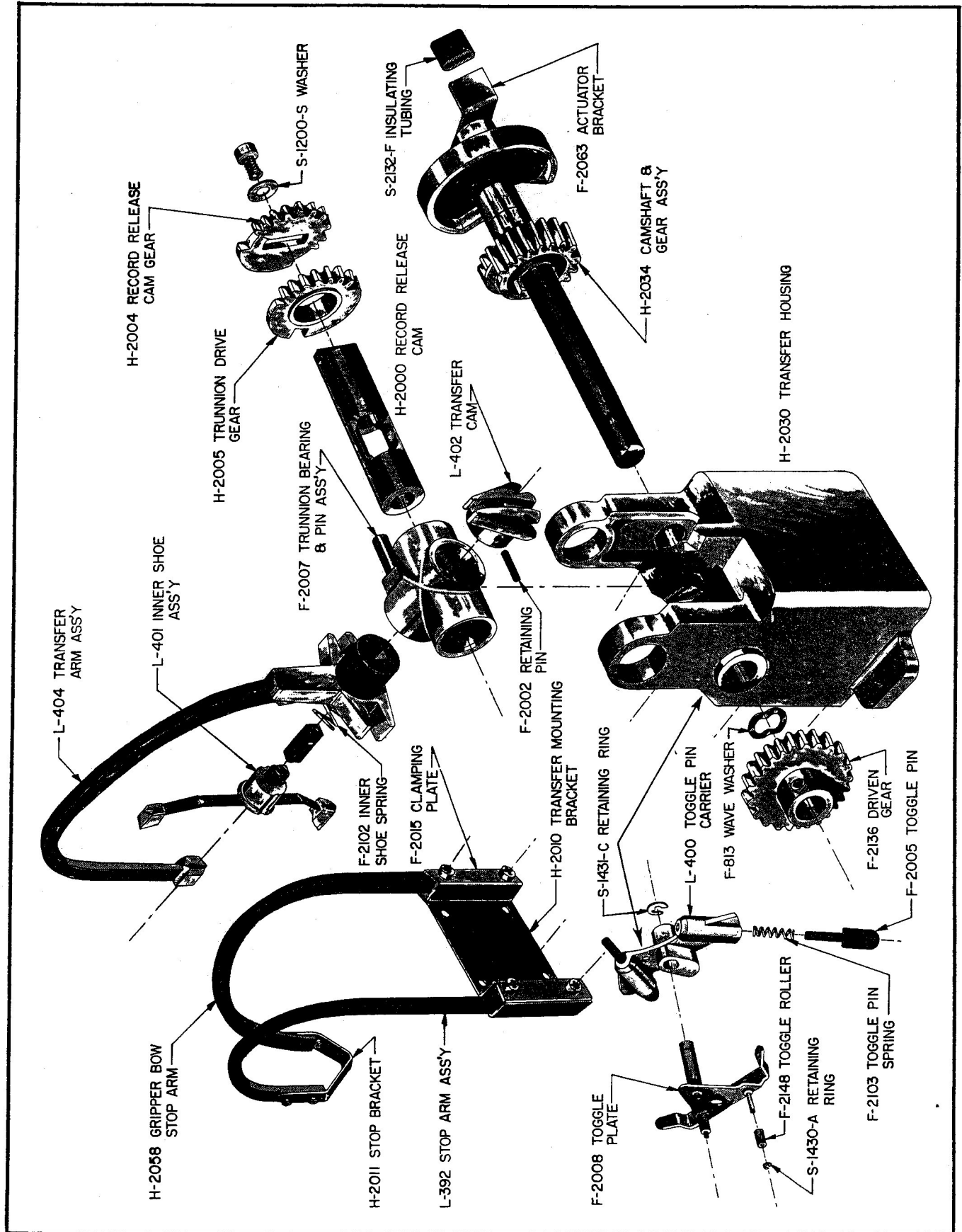


FIG. 17. - TRANSFER ASSEMBLY PARTS GROUP

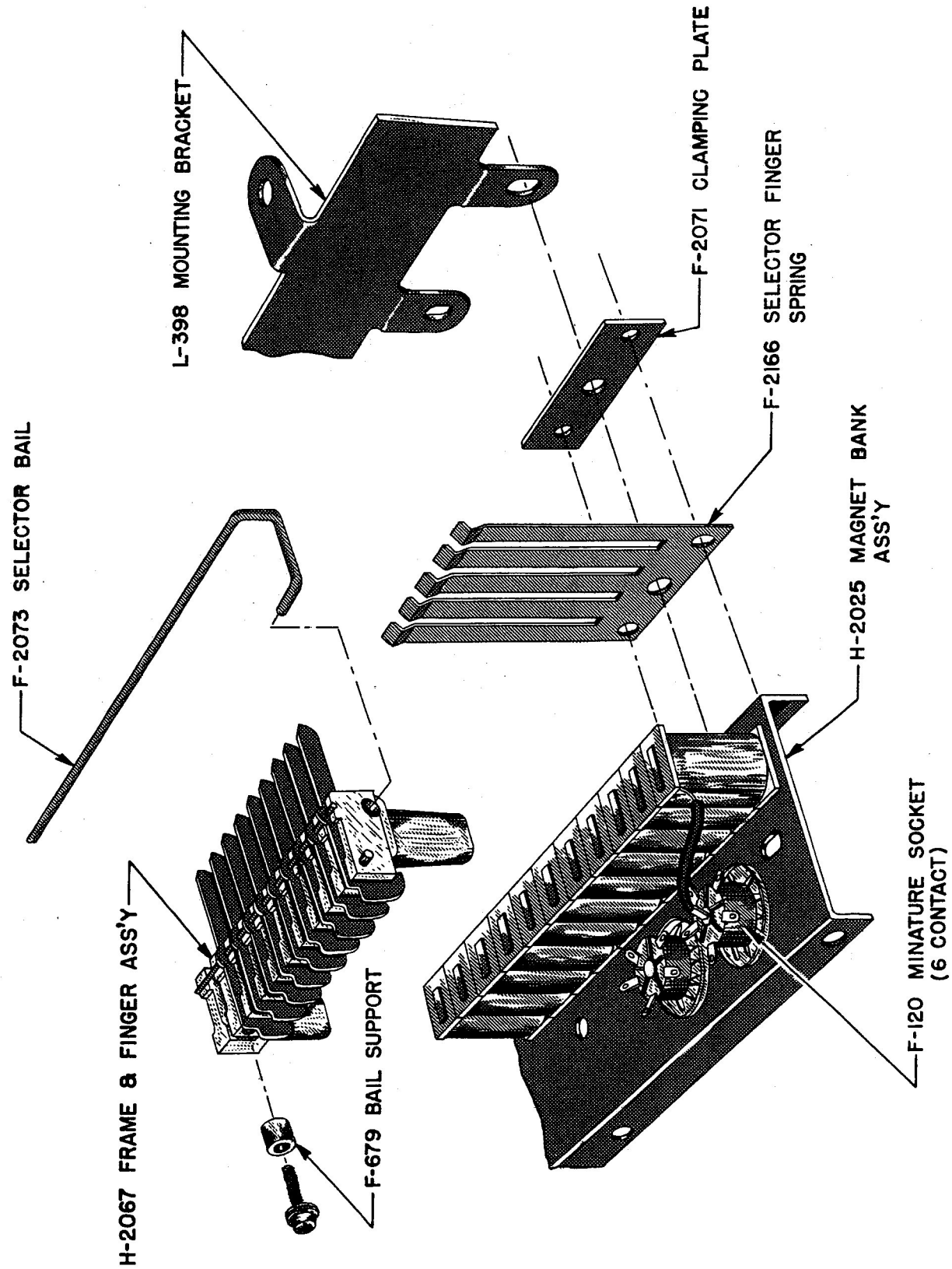


FIG. 18. - H-2065 MAGNET BANK AND FRAME ASSEMBLY PARTS GROUP

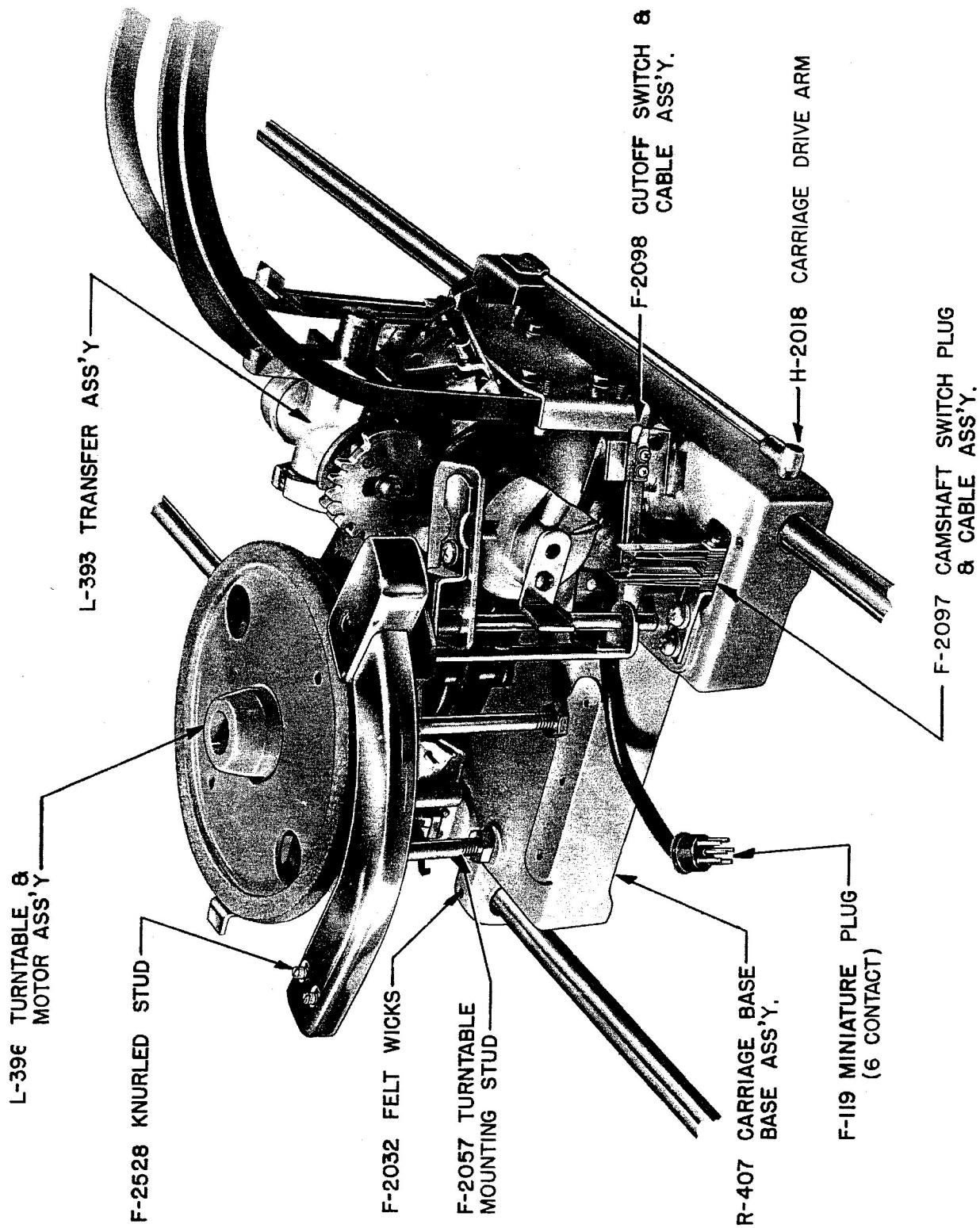


FIG. 19. - CARRIAGE - RIGHT SIDE VIEW

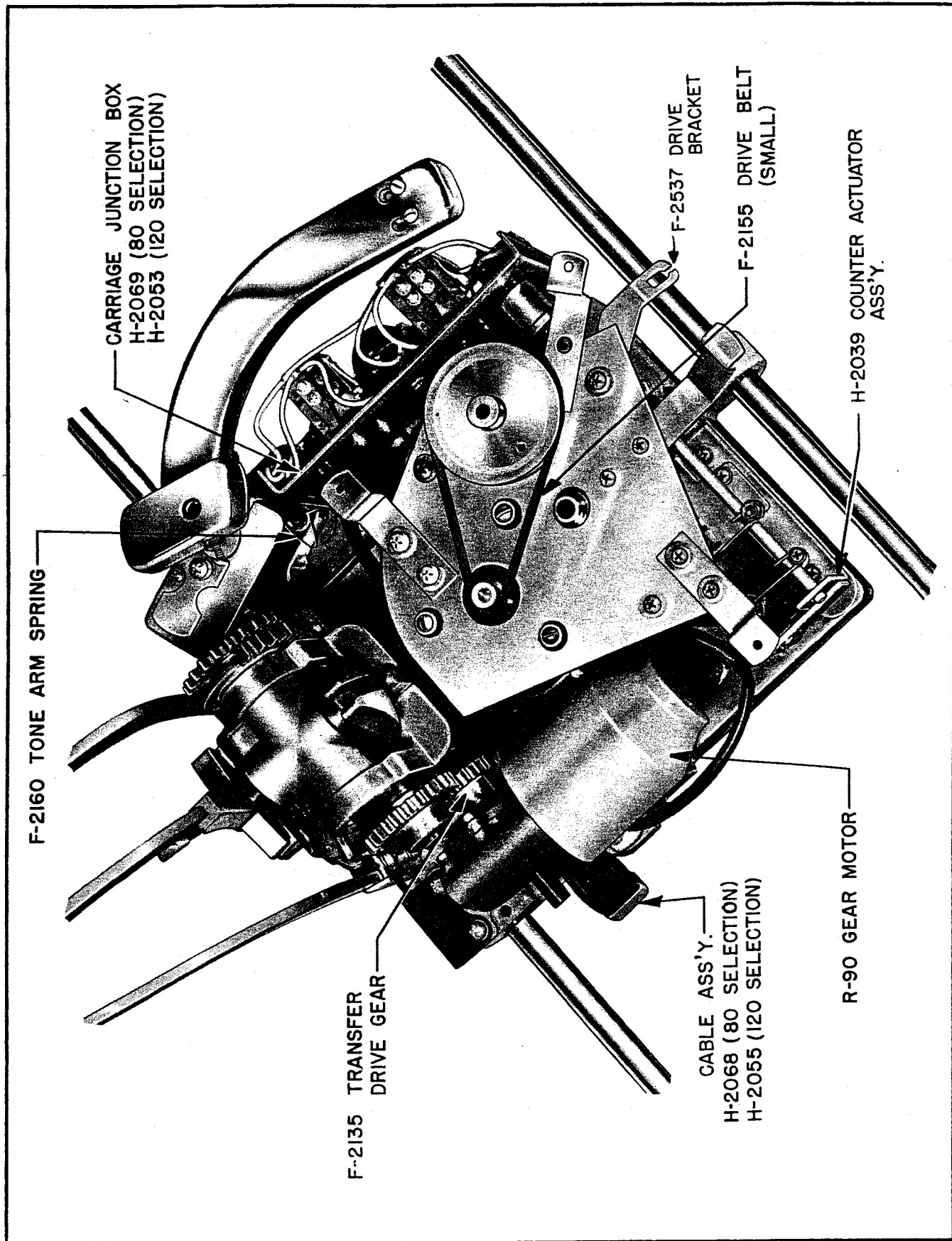


FIG. 20. - CARRIAGE - TOP VIEW

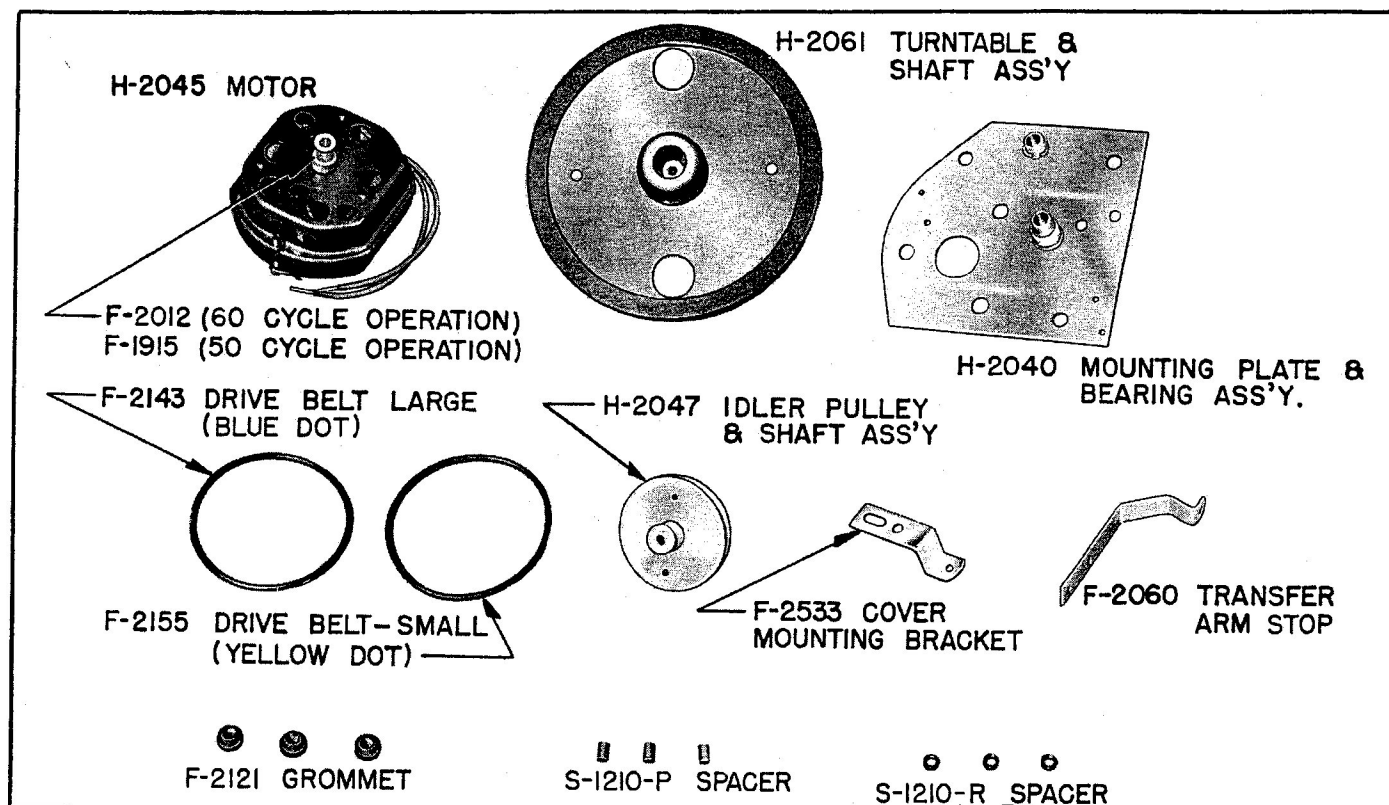


FIG. 21. - TURNTABLE PARTS GROUP

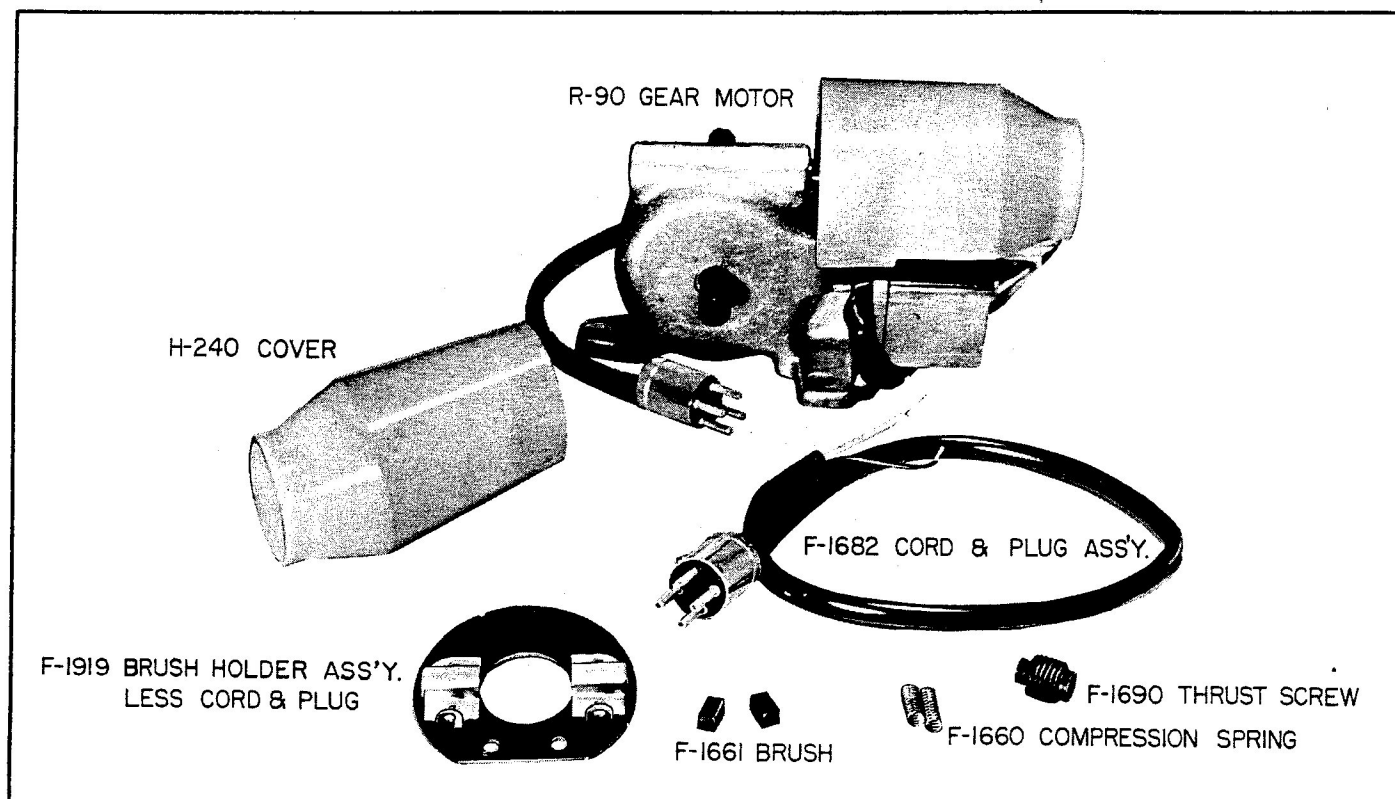


FIG. 22. - GEAR MOTOR PARTS GROUP

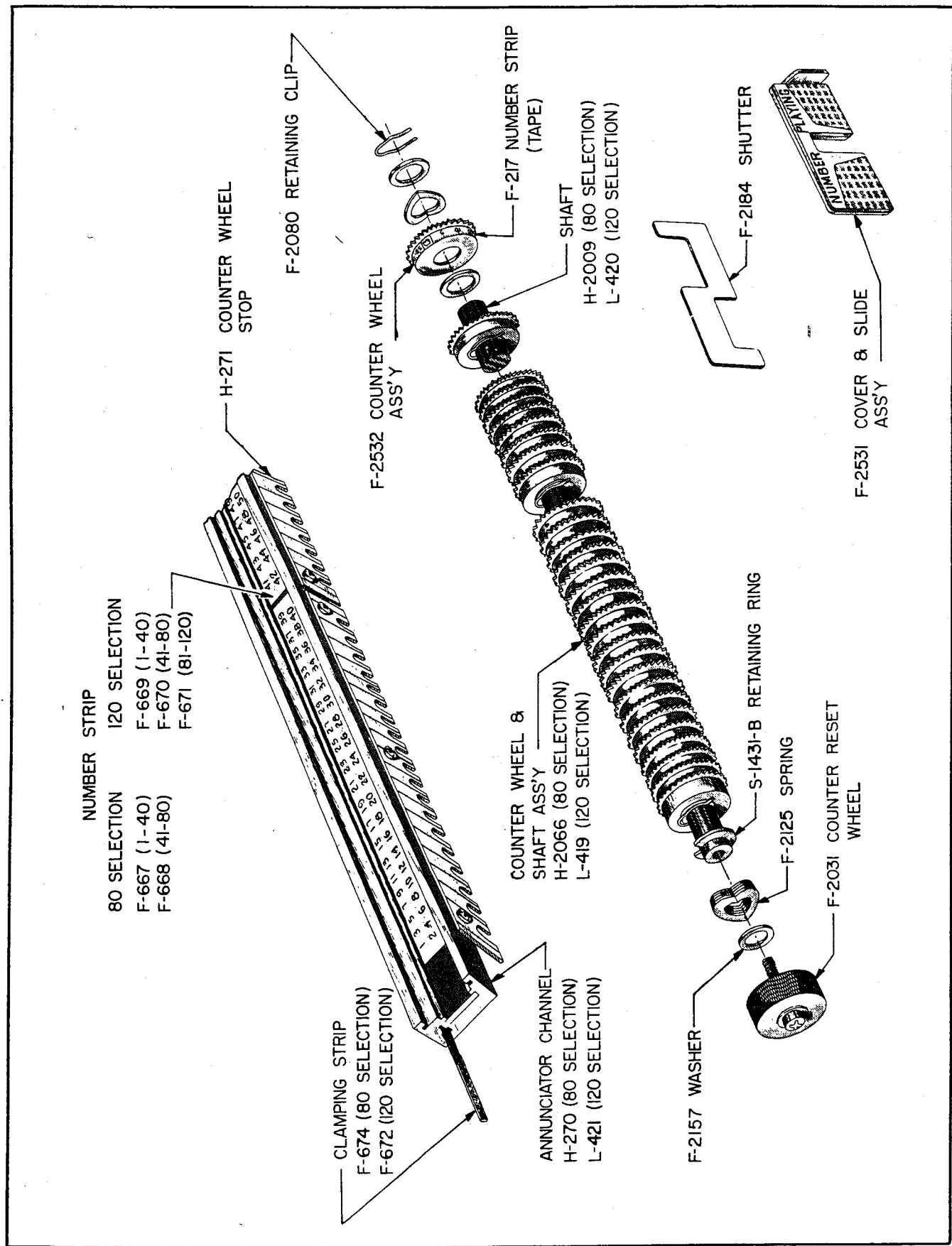


FIG. 23. - ANNUNCIATOR AND RECORD COUNTER PARTS GROUP

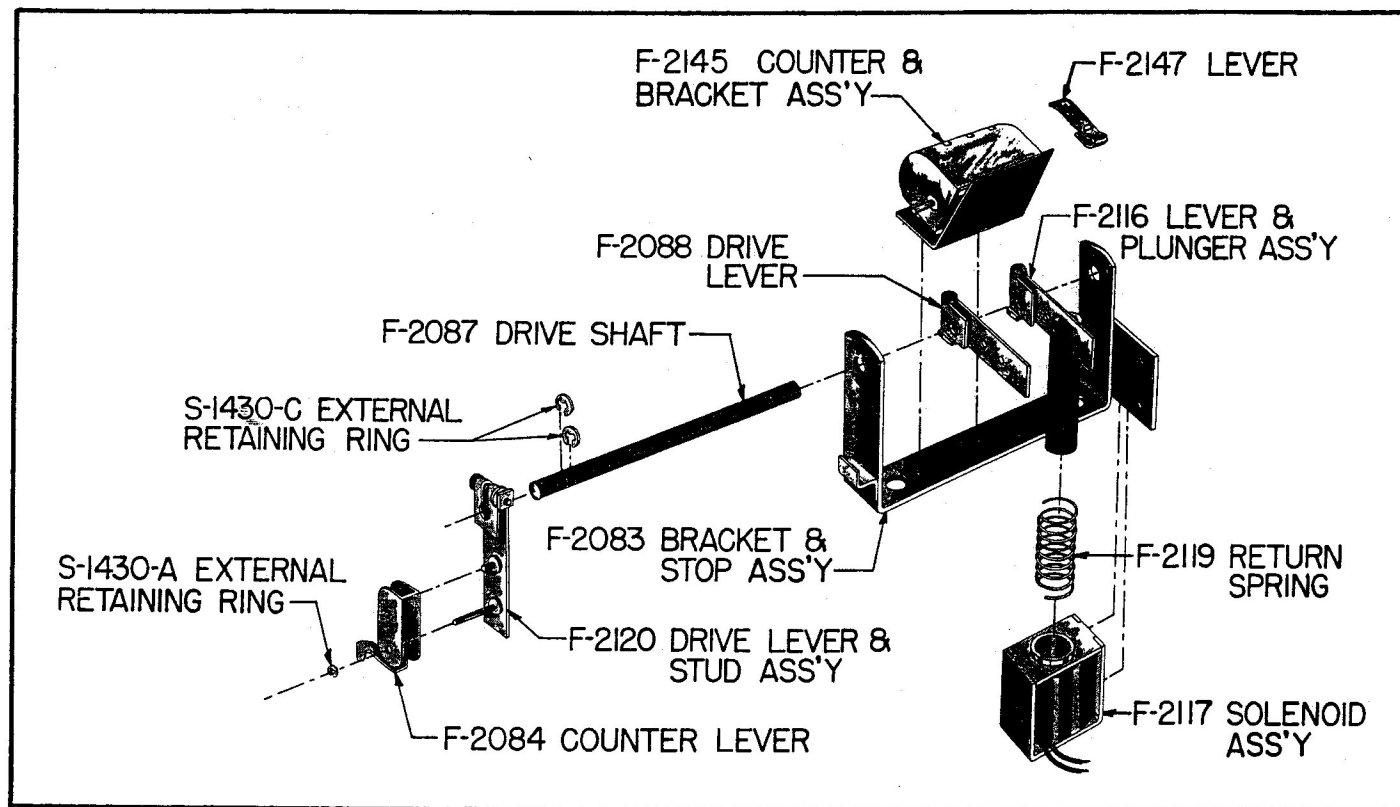


FIG. 24. - COUNTER ACTUATOR PARTS GROUP

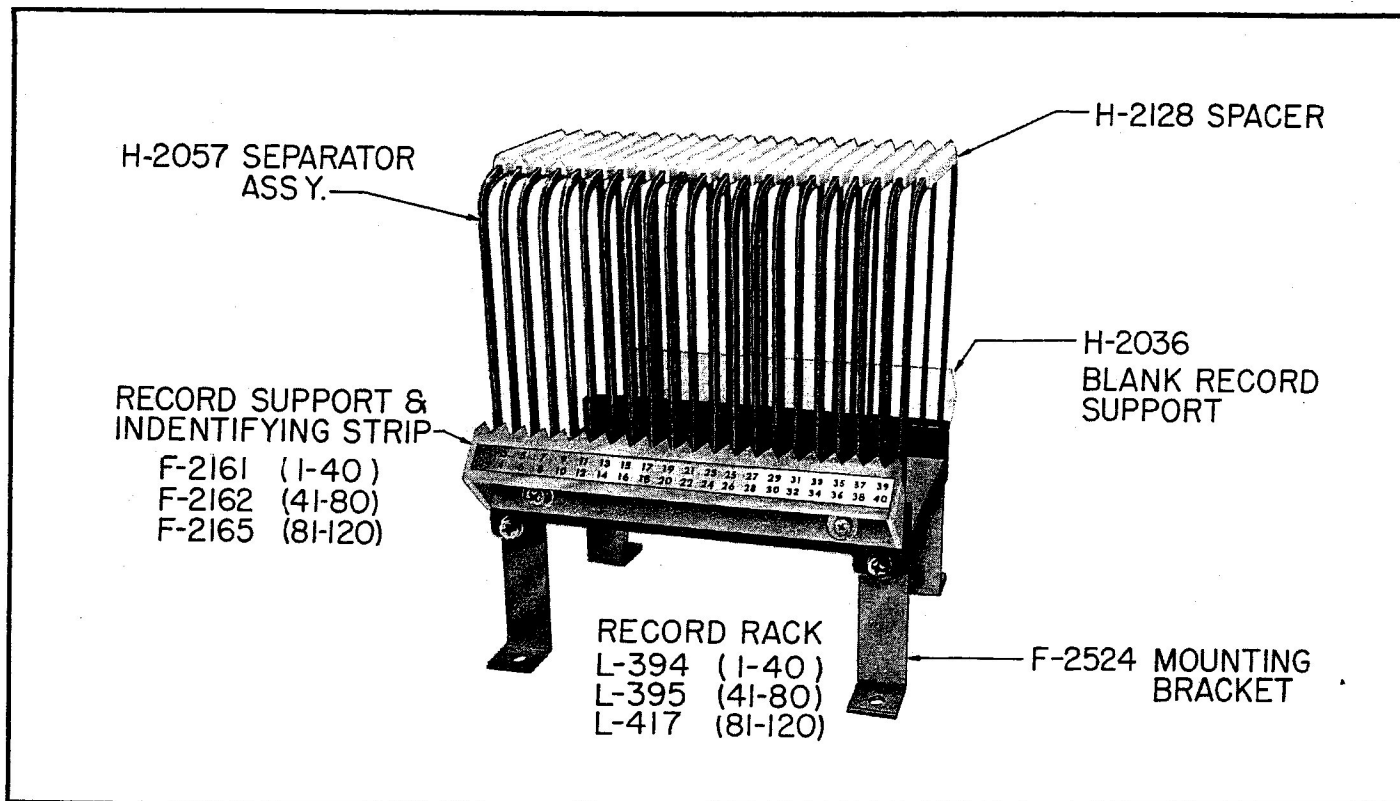
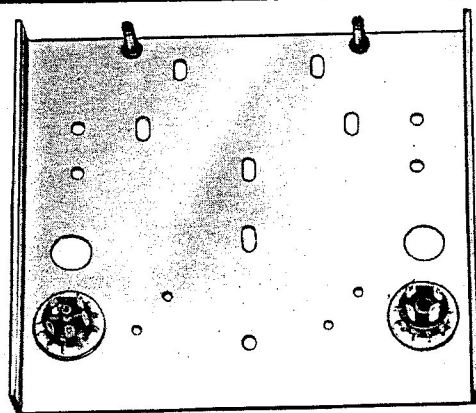
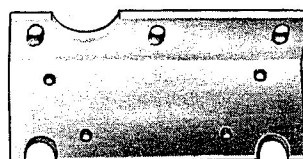


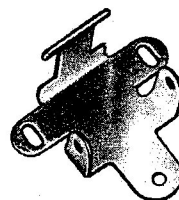
FIG. 25. - RECORD RACK ASSEMBLY



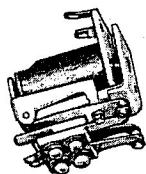
H-2075 CARRIAGE SWITCH MOUNTING PLATE WITH STUDS



F-2019 MOUNTING BRACKET



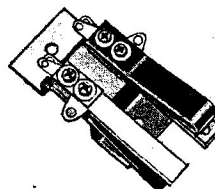
H-2012 CARRIAGE SWITCH FRAME



H-2022 REVERSING RELAY



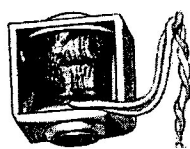
H-257 SELECTION RELAY



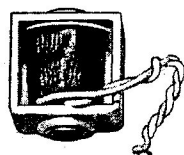
F-2131 CARRIAGE SWITCH ASS'Y.



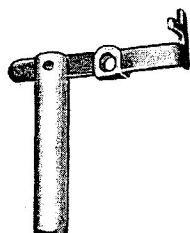
F-2030 CARRIAGE SWITCH PIVOT ROD



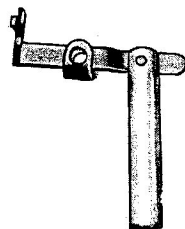
F-661 RESET SOLENOID ASS'Y.



F-2129 LEVER, PAWL & LIFTER ASS'Y.



F-441 RESET LEVER & PLUNGER ASS'Y (L.H.)



F-440 RESET LEVER & PLUNGER ASS'Y (R.H.)

S-114-A RESISTOR
20 Ω (10 WATT)



F-131 CABLE CLAMP



F-829 GROMMET



F-1257 HAIRPIN CLIPS



FIG. 26. - CARRIAGE JUNCTION BOX PARTS GROUP

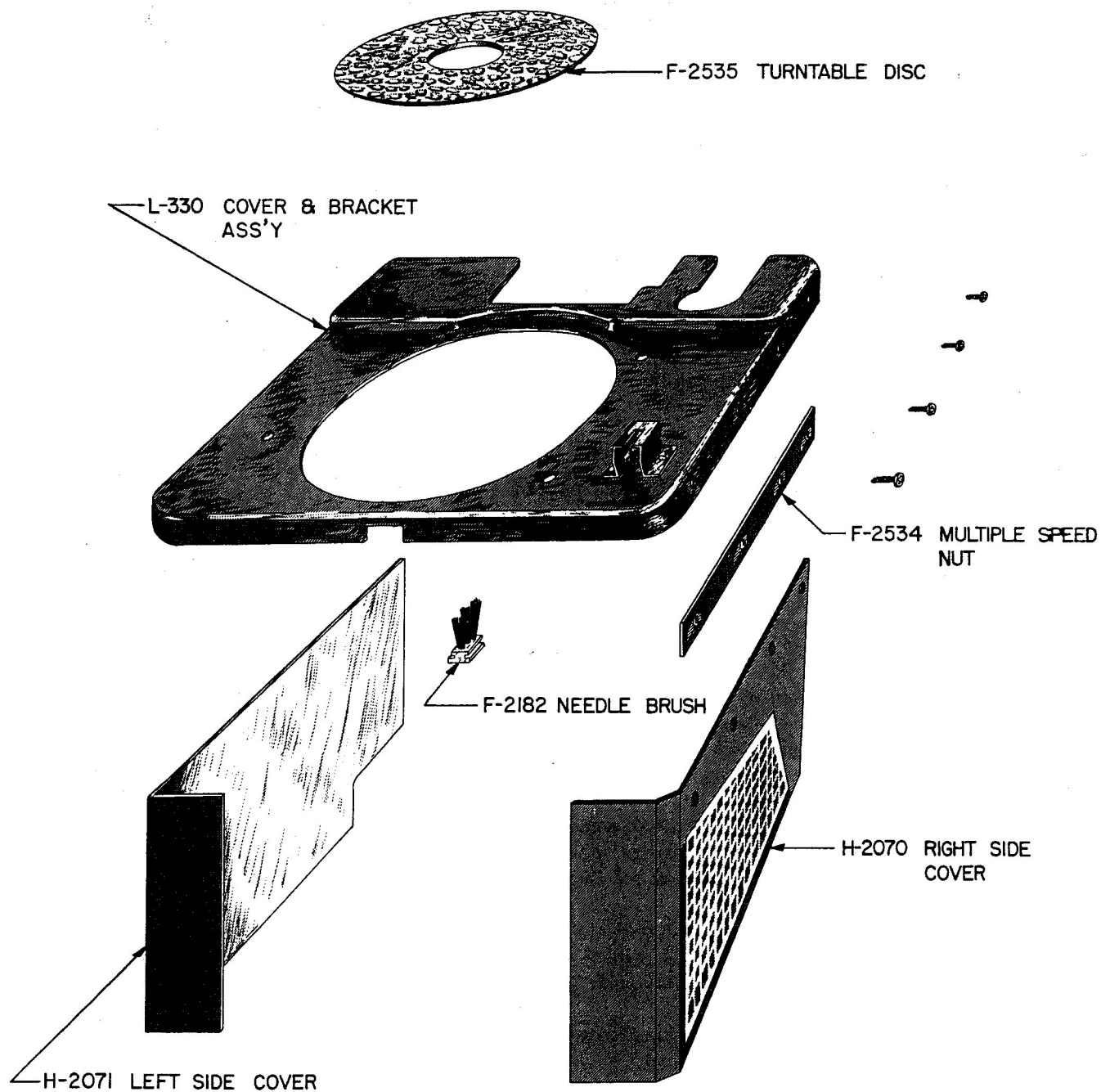


FIG. 27. - L-324 COVER ASSEMBLY PARTS GROUP

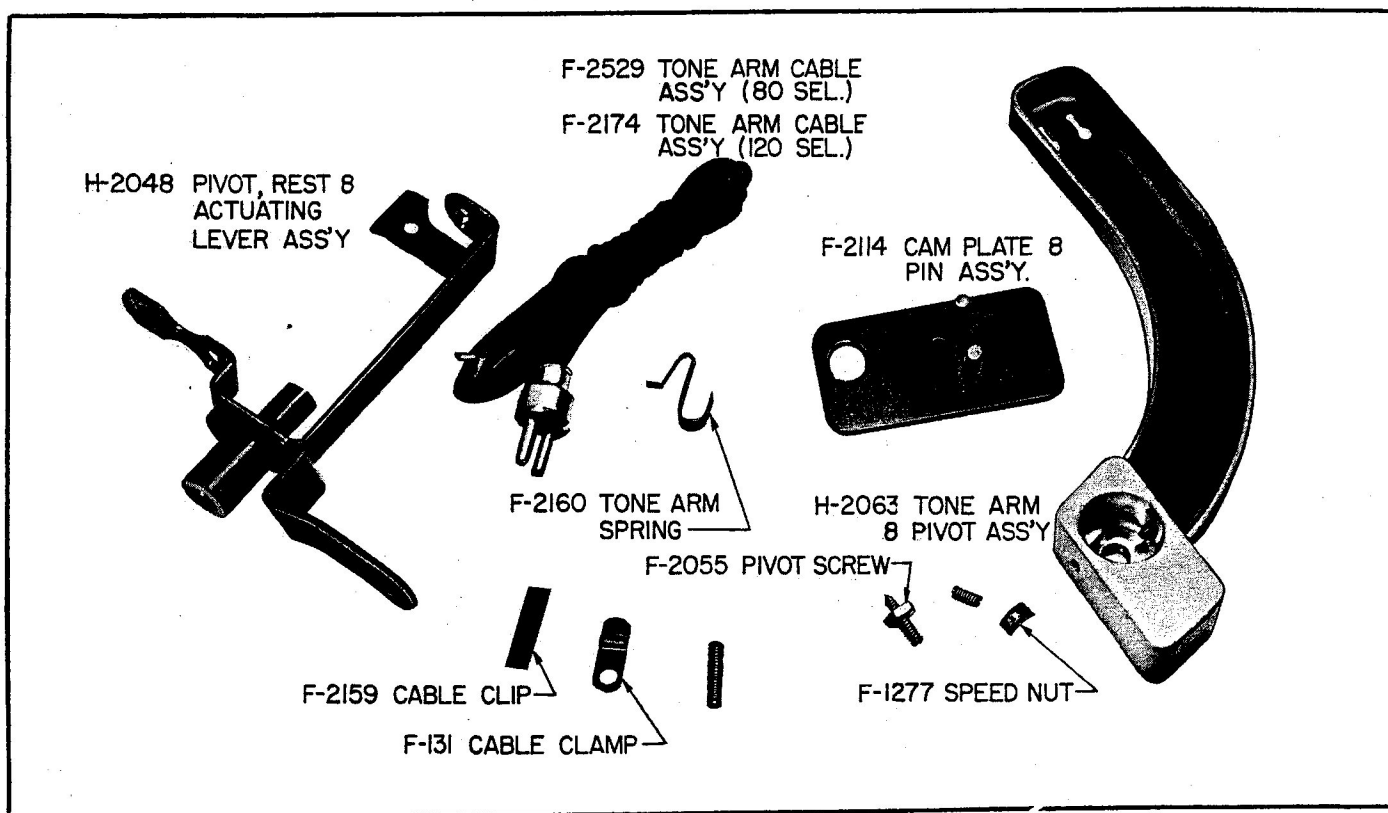


FIG. 28. - TONE ARM PARTS GROUP

WARNING

Examination of the adjustment data will show that there is a precise interrelationship between all directly functioning mechanism components. The illustrations which follow will demonstrate this interrelationship and also show the step by step functioning of elements for the entire phonograph.

When major service work is performed on the mechanism, it will be helpful if at least one of the variables remains fixed so that readjustment can be made relative to the position of the fixed variable.

The usual reference variable which is held fixed when the mechanism is entirely stripped is the left hand record rack. Other components which would serve the same purpose would be the other record racks and for pairs of selector banks.

If removal of the reference variable also is necessary, it can be removed after readjustment is completed.

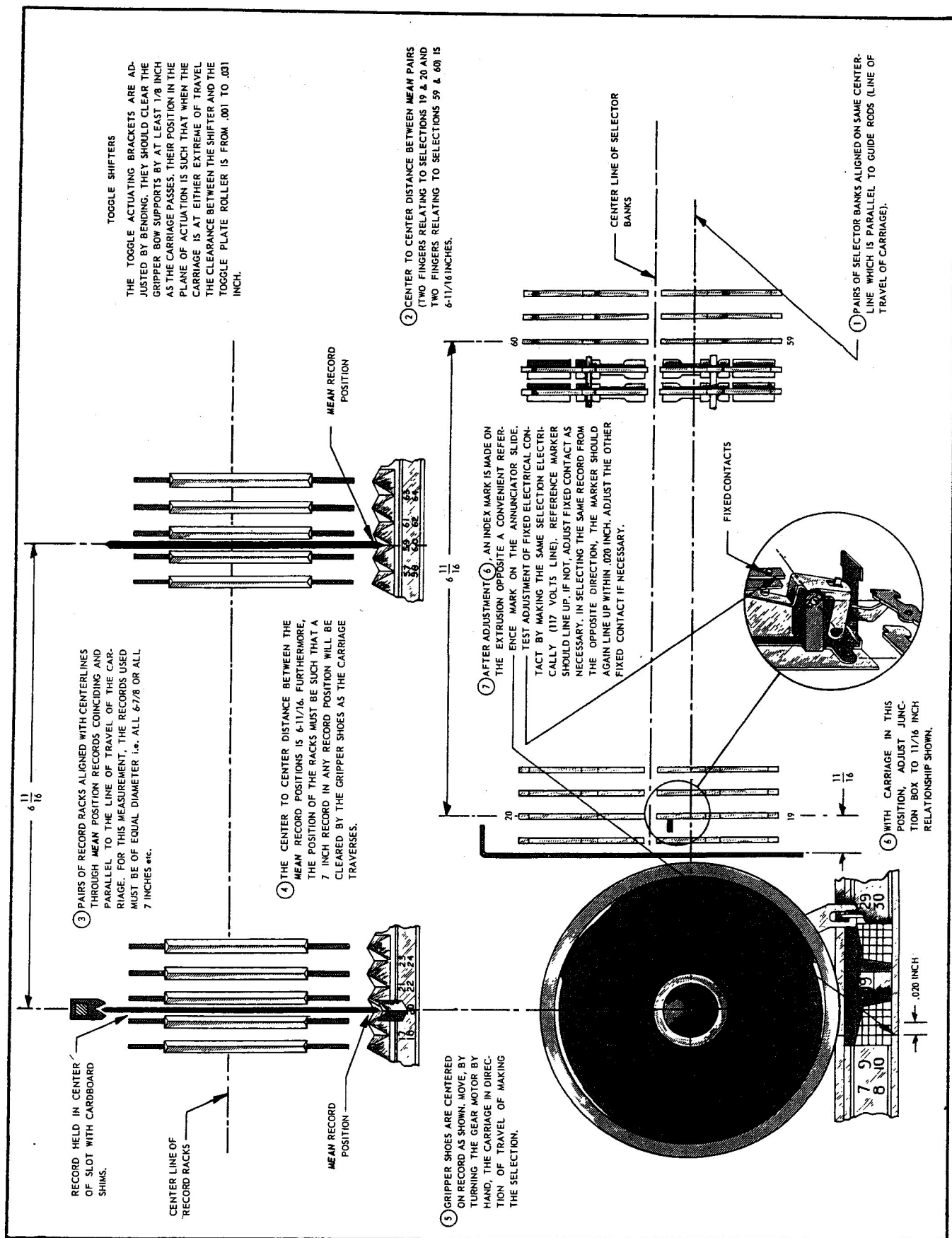
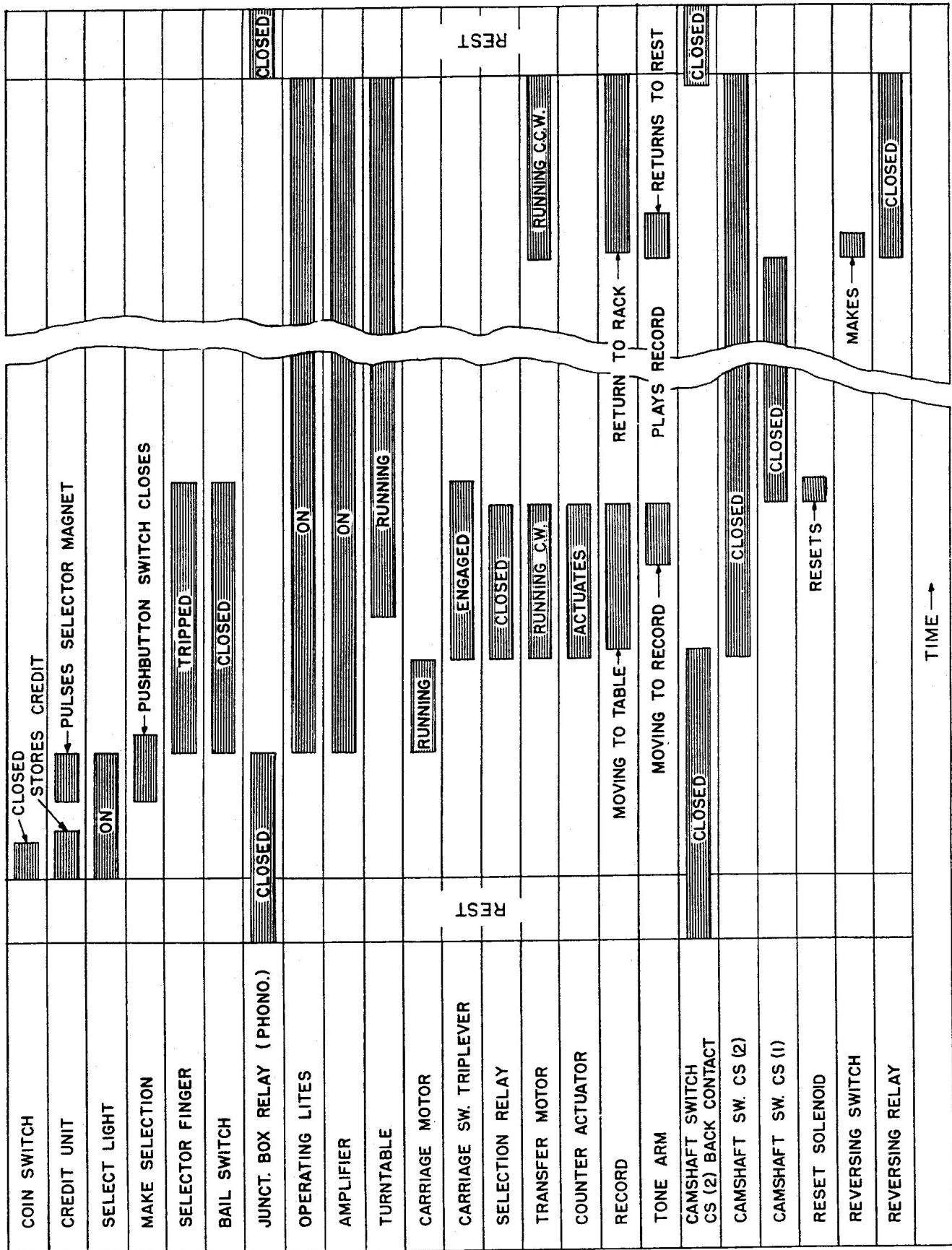
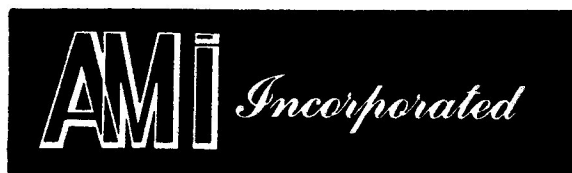
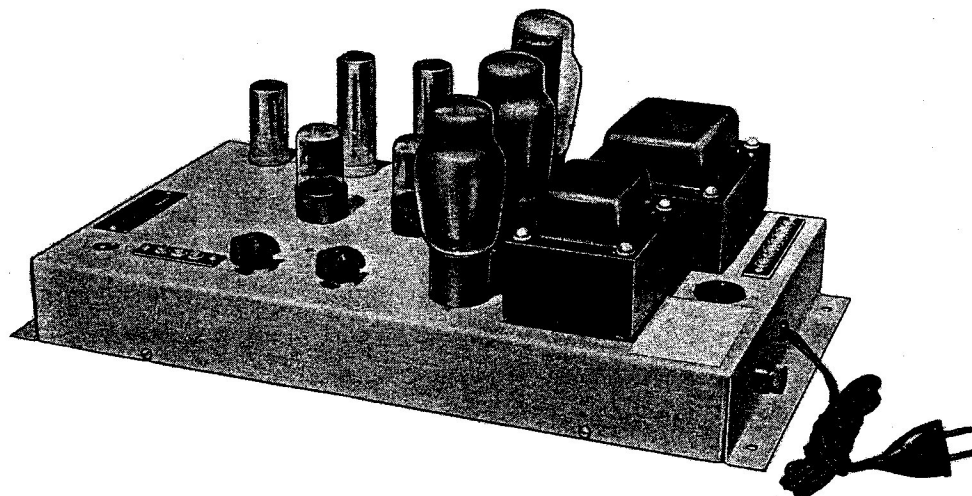


FIG. 29. - INTERRELATIONSHIP OF MECHANISM COMPONENTS



STEP BY STEP FUNCTION OF COMPONENTS
IN 45 RPM AMI PHONOGRAPHS

R-111 & R-105 AMPLIFIER MANUAL



**1500 UNION AVENUE, S.E.
GRAND RAPIDS 2, MICHIGAN**

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THE AMPLIFIER

The R-111 and R-105 Amplifiers have been carefully engineered to meet the most exacting performance standards, and incorporates the following features which are of prime importance to the operator:

1. Simplified Circuitry.
2. Reduced Tube Complement – Only three tube types need be stocked.
3. Individual Bass and Treble Controls.
4. Point-to-Point Wiring for Quick, Easy Servicing.
5. Provision for Remote Speaker Installation – Up to 6 speakers may be operated simultaneously.

Adjusting the tonal response of these Amplifiers to meet the requirements of any location is a simple matter. Bass and Treble may be quickly and easily set by means of three-position switches which are clearly marked *Low, Normal, and High*.

THE VOLUME CONTROL

The volume control regulates the power output of the amplifiers smoothly and effectively and may be remote if so desired by merely adding the necessary cable length. The two terminals to which the control is attached to the amplifier chassis are clearly identified.

THE CRYSTAL PICKUP

The crystal pickup used in conjunction with the Amplifier is of the ceramic element type. This type of crystal is unequalled in its ability to withstand excessive heat and humidity. The crystal, normally furnished with a replaceable self-polishing osmium needle, provides exceptionally long record life. A replaceable sapphire needle is also available. **Caution:** The F-1673 Pickup and R-111 Amplifier and the F-2527 Pickup with the R-105 Amplifier have been carefully integrated to insure optimum performance. The use of other crystals which exhibit a different frequency response and different electrical characteristics will result in unsatisfactory performance.

LOUDSPEAKERS

The Phonograph Speaker

The loudspeaker furnished with the phonograph is a heavy duty 15 inch permanent magnet type, and has a voice coil impedance of 16 ohms. It is capable of handling the full output of the amplifier without overloading.

Remote Speaker Application

The amplifiers are designed to handle those installations which require additional speakers for adequate sound coverage. The phonograph speaker may be used in conjunction with remote speakers or remote units alone may be used in Hideaway installations. Either 8 ohm or 500 ohm remote speakers can be used where the location requires one or two additional speakers. Where more than two remote units are installed, it is not advisable to employ 8 ohm speakers since the power loss in the speaker lines would prove excessive. Therefore, provision has been made for connecting no more than two 8 ohm remote speakers (with or without the phonograph speaker).

500 ohm remote speakers have negligible line loss, and so provision has been made to connect up to five 500 ohm remote units in addition to the phonograph speaker or up to six 500 ohm speakers when the phonograph speaker is not employed. Proper connection of the speaker leads and the necessary jumper wires are shown on the *Speaker Connection Chart* located on the amplifier chassis. This connection chart will also be found on page 4 of this manual. Loudspeakers connected according to this chart will receive equal power from the amplifier.

The **AMIVOX** remote speaker is highly recommended for either large or small remote speaker installations. Both 8 ohm and 500 ohm input are standard with the unit.

For those installations which require greater volume from the phonograph speaker than from the remote speakers (or vice-versa), refer to the connection chart for unequal power to speakers which will be found on page 5 of this manual.

For individual control of speaker volume in a multiple-speaker installation, "L" pads can be connected to each speaker. The "L" pad should match the impedance of the speaker and line with which it is used. The **AMIVOX** extension speaker is equipped with an adjustable "L" pad to facilitate proper balancing of individual speaker volume levels.

AMPLIFIER SERVICE INFORMATION

It is strongly recommended that the serviceman thoroughly familiarize himself with the following information prior to servicing the R-111 & R-105 amplifiers.

Basic Circuit

The high-voltage power supply is entirely conventional. 60 cycle line voltage is stepped up by the power transformer, rectified by the 5U4-G tube, and fed into the multi-section resistance-capacitance filter circuit.

Push-pull 6L6-G power amplifier tubes, operated in class AB₁, deliver up to 22 watts into the output transformer. Inverse feedback is employed to reduce distortion and improve frequency response. It is obtained from a separate winding on the output transformer and is introduced into the cathode circuit of the triode stage preceding the phase inverter. The secondary windings of the output transformer are connected to the terminal strip marked *Speakers*. These windings may be connected together by suitable jumper wires so that they are either in phase or out of phase. Thus many different values of impedances may be matched to the output of the amplifier.

Phase inversion is accomplished by means of a split-load phase inverter. One-half of the second 6SN7-GT tube is employed to this end. In such a circuit, the signal input and plate output are opposite in phase, while the input and cathode output are of the same phase.

This arrangement supplies equal signal voltages of opposite phase to the grids of the 6L6-G tubes. It must be remembered that these equal output voltages depend upon the matched plate and cathode resistors in this stage.

The phase inverter is preceded by a triode amplifier stage which is direct-coupled to the phase inverter grid. This stage comprises the other half of the above 6SN7-GT tube. Circuits of this nature offer several obvious advantages. Fewer components are required, undesirable phase shift is eliminated, thereby allowing larger amounts of feedback, and better frequency response is obtained.

The Treble Control Circuits are inserted between the first and second 6SN7-GT tubes.

The Volume Control is associated with one triode section of the first 6SN7-GT tube which is employed as a cathode follower. The output from this stage passes into the Treble Control network.

The first audio stage consists of the other section of the first 6SN7-GT, and is a conventional triode amplifier. The cathode is left unbypassed in the R-111 Amplifier

and so introduces degeneration into this portion of the circuit. In the R-105 Amplifier the cathode is bypassed, increasing the overall gain.

The Bass Control network is inserted between the input terminals and the grid of the first audio stage.

The Volume Control

Control of the level is accomplished through voltage divider action in the cathode circuit of the second audio stage. The volume control potentiometer itself comprises the bottom leg of the voltage divider and the audio signal which passes on to subsequent stages is developed across this control. Due to the low impedance of a cathode follower output circuit, little difficulty will be experienced in remoting the volume control as far as hum pickup is concerned. Where the volume control is to be remoted for unusually long distances in particularly noisy locations (in close proximity to neon lamps and other disturbing electrical appliances), it may be desirable to ground the amplifier by connecting a wire from the *ground* terminal on the volume control terminal strip to a water pipe or other good electrical ground. This procedure will effectively prevent hum pickup. Where it is not practicable to ground the system in this manner, shielded cable may be employed to remote the volume control. However, proper grounding will prove more effective in controlling hum pickup.

The network preceding the grid of this tube is designed to establish a fixed D.C. voltage at the grid, and so prevent distortion which might occur due to overloading.

One unique feature of these amplifiers is the circuit which is designed to compensate for the Fletcher-Munson effect. Fletcher-Munson curves show that as sound intensity diminishes, the ability of the human ear to perceive sound at low frequencies is less than at middle-range frequencies. This circuit includes the 220,000 ohm and 22,000 ohm resistors and the .005 Mfd capacitor which are located at the grid of the volume control tube. Coupled with the volume control the above network provides bass boost necessary to overcome this deficiency as the volume level is reduced.

Bass and Treble Control Circuits

These networks provide the frequency compensation required for the varied acoustical problems which will be encountered.

Both of these networks have been tailored to match the frequency response and electrical characteristics of the F-1673 and F-2527 pickups furnished as standard equip-

ment in phonographs using either the R-111 or R-105 amplifiers. It is extremely important that the service man recognize that any modification of these circuits will detract from the performance of the amplifier and may lead to completely unsatisfactory results.

The Bass Control Circuit consists of three filter sections, any one of which may be selected by means of the three-position bass switch. These filters are properly designed to compensate for recording characteristics, the low frequency response of the pickup, and the bass level required for a given installation. In order to achieve proper compensation under varying conditions, the use of separate filter sections and a suitable switch is far more effective than a single variable control.

The Treble Control will effectively compensate for record condition and employs three filter networks which are matched to the high frequency characteristics of the pickup. These filters are of the band-stop type and exhibit a sharp null. The null is tuned to the frequency where the most objectionable record noise occurs and resultant attenuation is controlled by means of the convenient three-circuit switch.

Plate-Current Relay

The purpose of this relay is to render the turntable motor inoperative during the time interval required for the amplifier to warm up, thus preventing a small portion of the record from being played before the amplifier is operating properly. The relay is installed in the cathode circuit of the 6L6-G tubes so that the total plate current of both tubes passes through the relay coil. After the amplifier has warmed sufficiently, conduction in these power tubes will close the relay contacts, thus turning on the turntable motor and allowing the record to play. This process actually requires but a few seconds and

occurs only when the phonograph is not playing continually.

Failure of the turntable motor to start within a reasonable length of time will indicate that the 6L6-G tubes are becoming weak and will not conduct sufficient current to properly actuate the relay.

The Crystal Pickup

The F-1673 and F-2527 pickups have exhibited highly dependable performance in the field. The lower tracking pressures and higher needle compliance associated with this unit insure longer needle and record life.

These pickups are extremely versatile and can be used for the reproduction of standard 78 rpm, 33 $\frac{1}{3}$ rpm, and 45 rpm recordings. (*The gold colored stylus is designed for 78 rpm records, the red stylus for 33-1/3 and 45 rpm records*).

Replacing the needle is a simple operation. It is held firmly in place by a small rubber block into which the end of the needle is inserted. The needle tip is supported by the notched end of a pedestal-like shaft. To remove a needle, simply lift the tip out of this notch and turn it 90 degrees in either direction. Then pull the needle out of the rubber block. Installing a new needle follows the above process in reverse. Make certain that the shank is fully seated into the rubber block.

IMPORTANT

On the R-111 the number "78" is stamped adjacent to the nameplate. The number "45" is stamped on the R-105. Other numerals adjacent to the nameplate signify modifications.

AUXILIARY AMPLIFIER

In some installations it is desirable to provide for more audio power output than a single R-111 or R-105 Amplifier can develop. Typical of such an installation is one where the main Phonograph amplifier is used to drive the cabinet speaker and four remote speakers, and it is desirable to provide for additional remote speakers up to six in number. This can easily be provided for by a second or "slave" amplifier.

The "slave" amplifier is connected to the "master" amplifier as follows: connect the volume control terminals on the "slave" amplifier in parallel with the volume control terminals on the "master" amplifier, making certain not to reverse the polarity. Use only one

volume control, and use it on the "master" amplifier. This will control the volume of both amplifiers. Remove the 6SN7 tube nearest the serial plate from the "slave" amplifier. Output connections to speakers are made as usual according to the connection chart. The "slave" amplifier can be located at any reasonable distance from the Phonograph proper. The limitations that apply are basically the same limitations that apply to the remote volume control which is described elsewhere in this section.

Tone control for the entire system is as usual except that the bass control on the "master" controls both amplifiers.

SPEAKER CONNECTION CHART				
Connections are for equal power into each speaker.				
Numbers indicate terminals on speaker terminal strip.				
Cabinet Speaker	Remote Speakers Connected in Parallel		Jumper Number 1	Jumper Number 2
	Number & Impedance	Leads to Terminals	Connect Terminals	Connect Terminals
3 5	None			
2 4	1-8 ohm	3 4	5 6	
4 5	2-8 ohm	3 4		
2 4	1-500 ohm	1 7	5 6	
4 5	2-500 ohm	1 7		
4 5	3-500 ohm	1 3	4 7	
3 4	4-500 ohm	1 6	2 3	4 7
3 4	5-500 ohm	1 3	5 7	
None	1-8 ohm	4 6	2 3	
None	2-8 ohm	3 5		
None	2-500 ohm	1 4	2 3	6 7
None	3-500 ohm	1 7		
None	4-500 ohm	1 3	4 7	
None	5-500 ohm	1 6	2 3	4 7
None	6-500 ohm	1 3	5 7	

Fig. 1 Connection Chart – Equal Power Into Each Speaker

SPEAKER CONNECTION CHART				
Numbers indicate terminals on speaker terminal strip.				
Cabinet Speaker	Remote Speakers Connected in Parallel		Jumper Number 1	Jumper Number 2
Leads to Terminals	Number & Impedance	Leads to Terminals	Connect Terminals	Connect Terminals
Cabinet Speaker louder than each remote speaker.				
2 4	1-8 Ohm	2 6	5 6	
2 4	2-8 Ohm	2 6	5 6	
2 4	1-500 Ohm	2 7	5 6	1 4
2 4	2-500 Ohm	1 3	5 6	5 7
4 6	3-500 Ohm	5 7	2 3	1 3
4 6	4-500 Ohm	1 6	2 3	5 7
4 6	5-500 Ohm	1 6	2 3	5 7
Each remote speaker louder than cabinet speaker.				
3 4	1-8 Ohm	4 5		
2 5	2-8 Ohm	3 4	4 6	
3 4	1-500 Ohm	6 7	1 5	2 3
2 5	2-500 Ohm	1 4	3 7	4 6
2 5	3-500 Ohm	2 7	4 6	1 6
2 6	4-500 Ohm	4 7	1 3	
2 6	4-500 Ohm	4 7	2 3	1 6

Fig. 2 Connection Chart – Unequal Power to Speakers

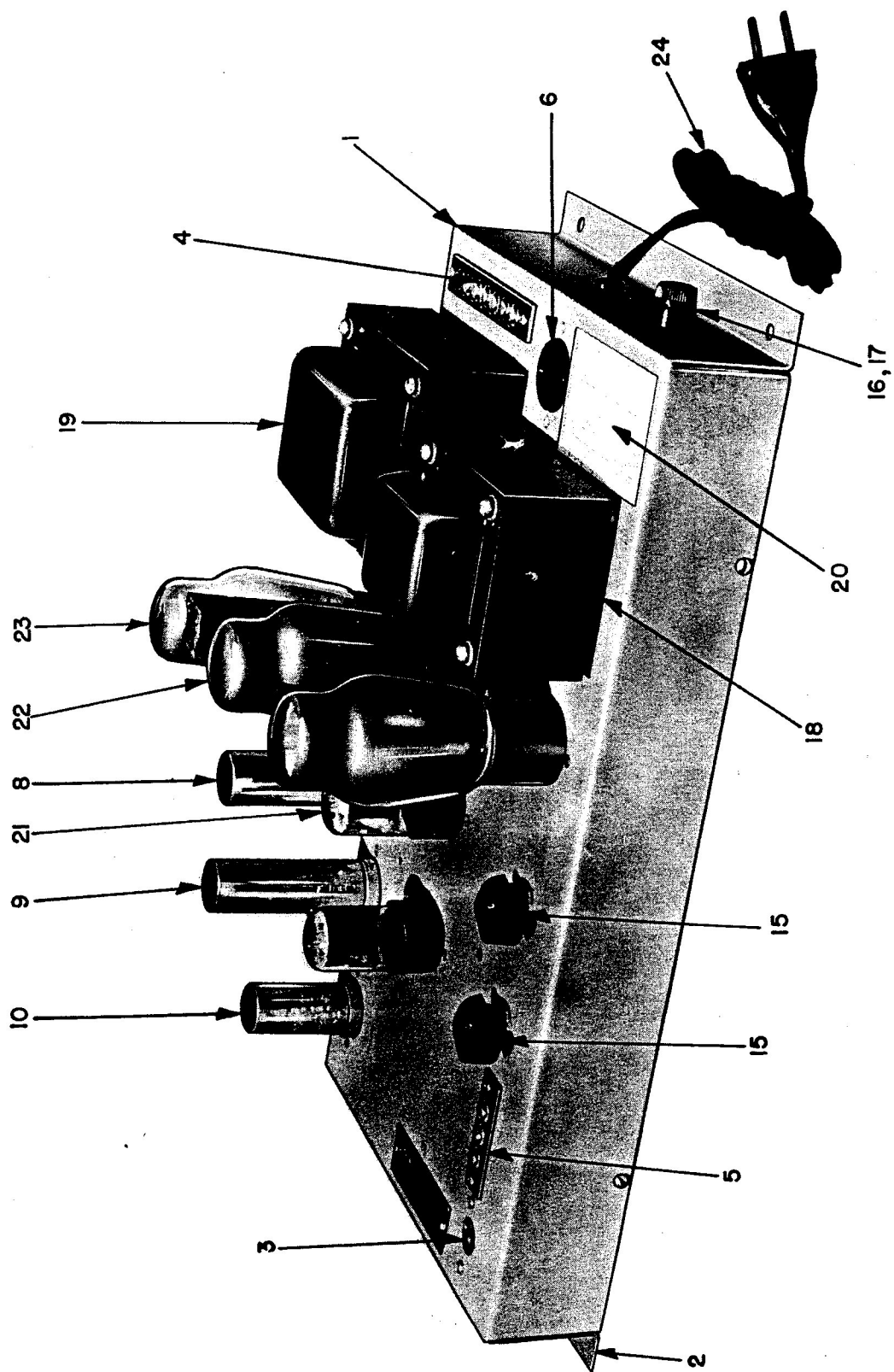


Fig. 5 Amplifier Chassis - Top View

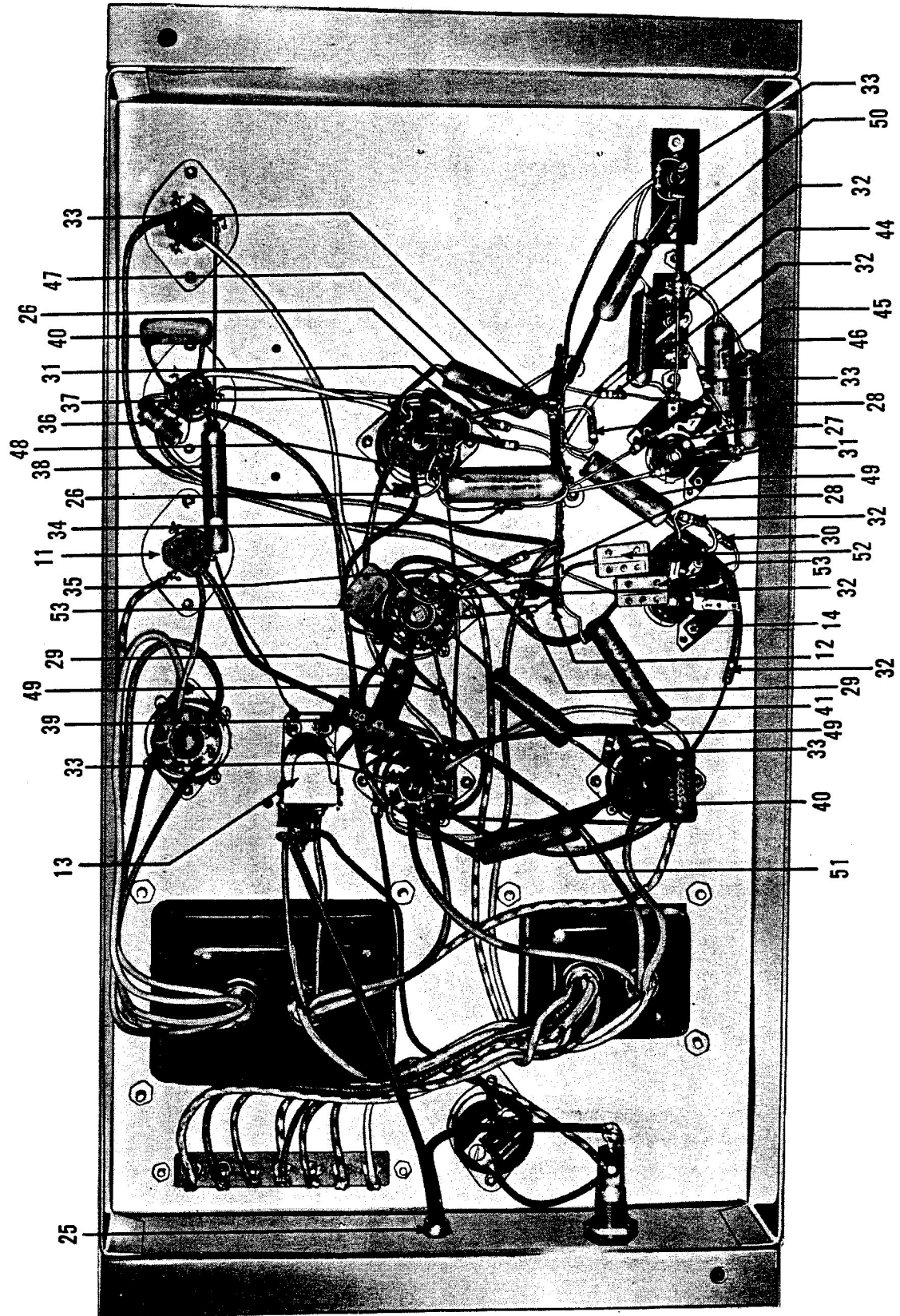


Fig. 6 R-111 Amplifier Chassis - Bottom View

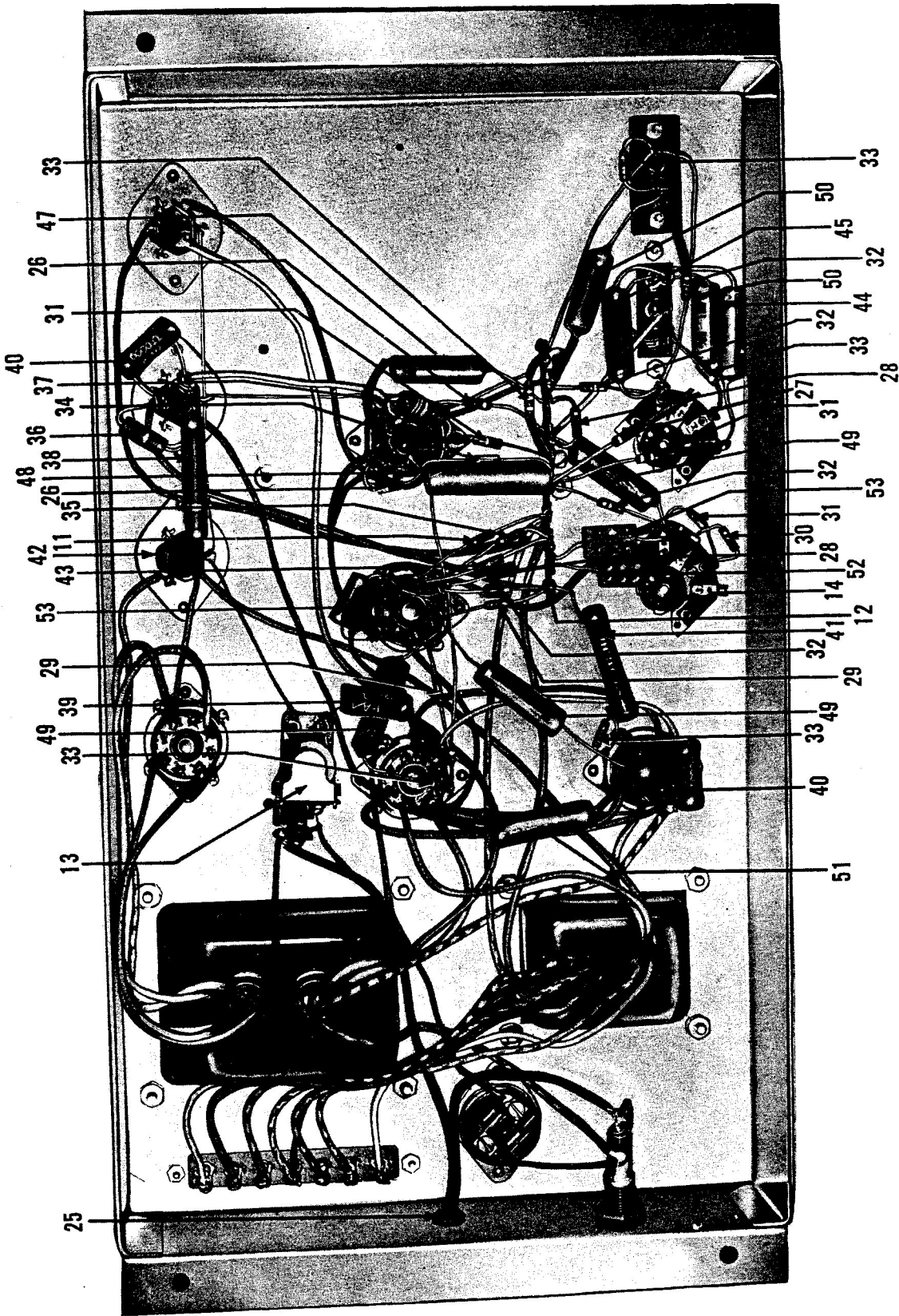


Fig. 7 R-105 Amplifier Chassis - Bottom View

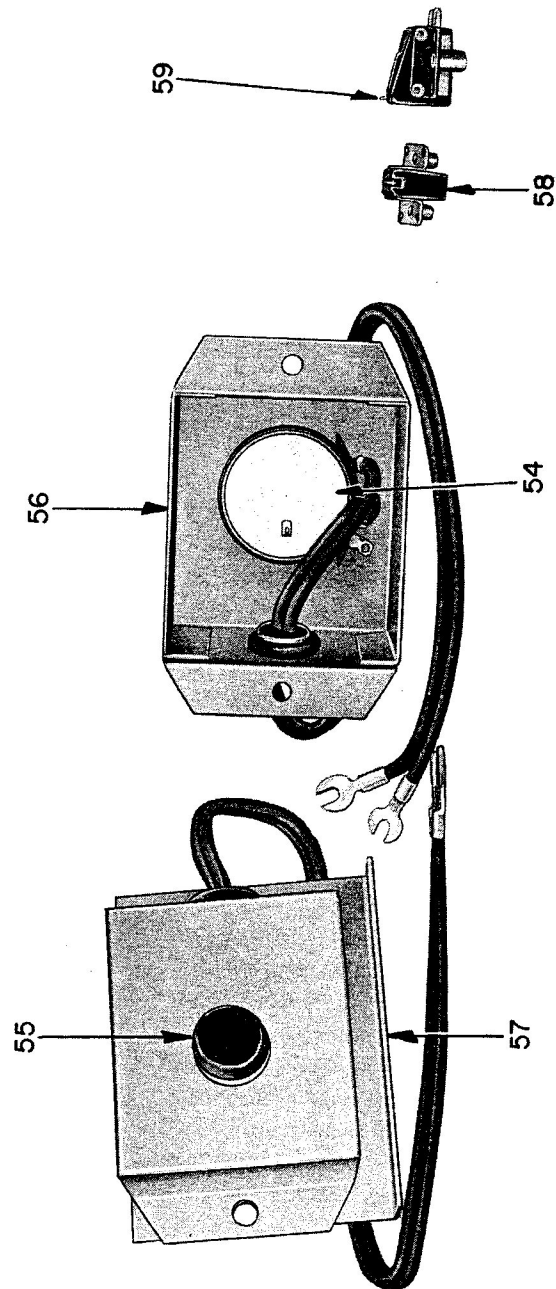


Fig. 8 Volume Control Box Ass'y. and Pickup Cartridge

R-111 & R-105 AMPLIFIER PARTS LIST

Code No.	Part No.	Description
1	L-104	Amplifier Chassis with Lettering
2	L-36	Bottom Cover
3	F-262	Terminal Strip
4	F-266	Terminal Strip
5	F-1189	Terminal Strip
6	F-1503	Receptacle - 2 Pole
7	F-267	Octal Socket
8	F-1292	Capacitor (Electrolytic) (40 Mfd) (450 Mfd) (15 Mfd) (450 Volts)
9	F-1685	Capacitor (Electrolytic) (15 Mfd) (450 Volts) (10 Mfd) (450 Volts) (20 Mfd) (150 Volts)
10	F-1686	Capacitor (Electrolytic) (20 Mfd) (150 Volts) (20 Mfd) (150 Volts)
11	F-1285	Adaptor Plate
12	F-627	Terminal Strip
13	H-261	Relay
14	F-1671	Switch
15	F-1249	Knob
16	F-861	Thermal Fuse Holder
17	S-720A	Cartridge Fuse (2 Amperes)
18	L-136	Transformer - Output
19	L-137	Transformer - Power
20	F-1689	Speaker Connection Chart
21	F-273	6SN7-GT Tube
22	F-1072	6L6-G Tube
23	F-195	5U4-G Tube
24	S-500K	Cord and Plug
25	S-2321A	Strain Relief
26	S-104D	Resistor (1,200 ohms) (Half Watt)
27	S-102F	Resistor (1.0 megohm) (Half Watt)
28	S-104K	Resistor (22,000 ohms) (Half Watt)
29	S-102A	Resistor (47,000 ohms) (Half Watt)
30	S-102B	Resistor (150,000 ohms) (Half Watt)
31	S-102G	Resistor (220,000 ohms) (Half Watt)
32	S-102L	Resistor (330,000 ohms) (Half Watt)
33	S-102K	Resistor (470,000 ohms) (Half Watt)
34	S-102D	Resistor (2.2 megohms) (Half Watt)
35	S-102N	Resistor (3,300 ohms) (Half Watt)
36	S-103A	Resistor (1,200 ohms) (One Watt)
37	S-103F	Resistor (68,000 ohms) (One Watt)
38	S-105A	Resistor (680 ohms) (Two Watt)
39	S-110C	Resistor (150 ohms) (Five Watt) Resistor (150 ohms) (Four Watt)

R-111 & R-105 AMPLIFIER PARTS LIST (Continued)

Code No.	Part No.	Description
40	S-110B	Resistor (6,000 ohms) (Four Watt)
41	S-114B	Resistor (15,000 ohms) (Ten Watt)
42	S-104U	Resistor (47 ohms) (Half Watt)
43	S-104N	Resistor (150 ohms) (Half Watt)
44	S-210J	Capacitor (.003 Mfd) (600 Volts)
45	S-210B	Capacitor (.002 Mfd) (600 Volts)
46	S-210K	Capacitor (.004 Mfd) (600 Volts)
47	S-210E	Capacitor (.005 Mfd) (600 Volts)
48	S-210P	Capacitor (.05 Mfd) (600 Volts)
49	S-210A	Capacitor (.02 Mfd) (600 Volts)
50	S-210F	Capacitor (.001 Mfd) (600 Volts)
51	S-210N	Capacitor (.01 Mfd) (600 Volts)
52	S-200A	Capacitor (.0002 Mfd) (400 Volts)
53	S-200C	Capacitor (.0005 Mfd) (500 Volts)
54	H-235	Potentiometer (Volume Control) (0-35,000 ohms)
55	F-1799	Knob (Volume Control)
56	H-717	Box (Volume Control)
57	F-719	Bracket (Volume Control)
58	F-1673	Cartridge - Crystal Pickup (Includes No. 59) for 78 RPM Recordings (E-40 Only)
	F-2527	Crystal & Stud Ass'y. (Includes No. 59) for 45 RPM Recordings (E-80 & E-120 Only)
	F-463	Cartridge - Crystal Pickup (Includes No. 59) for 45 RPM Recordings (Converted 40-Selection Mechanism Only)
59	F-506	Needle - Precious Metal Tip (For F-1673)
	F-427	Needle - Jewel Tip (For F-1673)
	F-426	Needle - Precious Metal Tip (For F-2527 & F-463)
	F-428	Needle - Jewel Tip (For F-2527 & F-463)